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Orthodontics

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ORTHODONTIC FACTS VERSUS FALLACIES

JOHN V. MERSHON, D.D.S., Sc.D., PHILADELPHIA, PA.

THE honor of being asked to address a group of eminent representatives of the orthodontic profession carries with it a responsibility. It is my obligation to speak to you of those things which, in the light of my experience, will benefit you most.

I speak without presumption because I come before you not to teach you dogmatically but to tell you what experience has taught me. Nineteen years in general dentistry and thirty-four years in orthodontics must teach a man something. The fact that my cases progress better and more easily today than they did twenty years ago leads me to believe that the things experience has taught me provide a sound approach to orthodontic treatment.

That which distinguishes a profession from a trade is the dominance of mental effort over manual effort. In orthodontics our manual efforts are expressed in the making and placing of orthodontic appliances; the mental effort is demonstrated in the planning of treatment, the analysis of individual differences, the understanding of growth processes, and the part the tissues of the body must play in our corrective work.

Almost anyone can learn the mechanics involved in the making of orthodontic appliances in a few weeks. Many of us have laboratory assistants of no more than average intelligence to do this work for us. Paints, brushes, and canvas, while necessary tools of the artist, have little intrinsic value until he makes of them a masterpiece. Without an intelligent and thoughtful mind to guide us in our use of orthodontic appliances, they are worse than useless; they are dangerous.

In orthodontics, as in most trades and professions, two things are responsible for wrong practices. One is dishonesty; the other ignorance. I am afraid

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many men practice worse orthodontics than they know. They treat early, they treat rapidly, they extract and do many things which they must know to be wrong. If we take time to give parents an educational talk at the beginning of treatment, few of them fail to understand the simple, fundamental biologic principles which make these procedures dangerous.

I am writing this paper for those men who may have wondered why they have not been able to produce the results claimed by the champions of speed. They may have failed to find the fallacious reasoning behind certain claims. I shall try to distinguish between fact and fallacy in the orthodontic practice, teaching, and writing of today.

In recent months, most of us have become familiar with a certain phrase used in connection with various types of unpreparedness. It is, "Too little and too late." If I were to coin a phrase which would describe the basis of wrong orthodontic practice, I would say, "Too much and too soon."

I admit frankly that if malocclusion could be corrected in a matter of hours *with safety* it would be highly desirable. No man is going to treat a case or watch a case one minute longer than he feels he should. His time could be used better in helping someone else in need of treatment. Likewise, no one is going to wait a day longer to start treatment than he feels he should. We wish to correct deformities as soon and as quickly as possible but only as soon and as quickly as we can *safely* do it. Safety is the watchword. It is better to do nothing than to do harm. What are our orthodontic efforts worth if the patient is left with a mouth full of decay, with nonvital teeth, resorbed roots, and damaged gingival tissues?

One practitioner reported, not long ago, that he had been able to decrease by at least 50 per cent the proportion of root resorptions as a result of orthodontic treatment, and he congratulated himself on his progress. Root resorptions and devitalization of teeth, as a result of orthodontic treatment, can be and should be nonexistent.

In determining the time to undertake treatment, we should begin at the end and ask ourselves when treatment can be finished. What is it which brings a normal human being, barring accident or physical handicap, to a satisfactory maturity? It is development. Growth, an inherent property of the organism, causes increase in bulk. This, coupled with differentiation, results in development. It is *this* which causes teeth to change their positions and *not* our appliances. How, then, can we best make use of this factor which is so essential to successful treatment? First, by showing a proper respect for it. Growth processes cannot be altered to suit our whims. But we can study them and use them to help us accomplish that which we desire. Orthodontics is not a tooth problem but a *growth* problem.

Our consideration of growth must embrace all tissues. Too many of us limit our concern to the teeth. They assume abnormal positions and relationships not because there is something inherently wrong with the teeth but because the other tissues do not follow the normal growth pattern. No one tissue is at fault. The tissues are so interdependent and their growth is so synchronized that their development must be a harmony of parts even when the resultant oral cavity does not measure up to our standards of ideal form.

As I have stated in former writings, muscle is the dominant tissue. It controls the length of bone and not the reverse as is often erroneously thought. Eminent men in both clinical and research branches of biologic studies support me in this belief.

The full growth and development of the average person is not reached until the early twenties. Nature, under the most favorable circumstances, seldom finishes the development of an individual before that time. How, then, can we hope to finish one part of an organism, namely, the mouth, before such a time, bearing in mind, as we must, that we are dealing with a defective individual in whom growth has gone wrong? Our sole function, as orthodontists, is to help the teeth, through the development of the tissues, which development goes on irrespective of us, to assume normal positions. We must realize that we cannot create growth; we can only try to direct it.

Many men, if asked to describe the thing which corrects malocclusion, would launch into an exposition of orthodontic appliances. Let them place an orthodontic appliance, full of unexpended force, on a skull with maloccluded teeth and see how much correcting is accomplished! We can do nothing without the help of growth. The fact that one case which looks just like another but takes many times the effort to correct shows the role of growth processes in treatment. When a child walks into your office, you unconsciously estimate his growth powers. If you see spindly legs, curvature of the spine and other associated symptoms, you are not surprised to find a fragile alveolus which will make every step in orthodontic treatment a difficult one.

Even when growth progresses ideally and cases react to treatment unusually well, we cannot dismiss patients safely until we believe they have reached maturity. We see mouths which never require treatment suddenly go bad at eighteen or twenty years of age. How, then, can we safely dismiss, before maturity, patients whose mouths have been abnormal? True, many mouths assume a normal appearance and retain it after comparatively little treatment, but can we honestly feel we have guarded a patient against possible later hazards if we send him forth, as finished, the minute we get the correct alignment of the teeth?

If, then, treatment cannot be considered completed until the individual reaches maturity, why should we wish to begin treatment early? Such a procedure makes treatment cover many more years than is necessary or advisable. Practically all early treatment is based on the idea that if you start early you finish soon. If, as I have tried to explain, this is not true but is a fallacy, why start early?

There are few rules without some exception. I shall state the instances in which I do some work at an unusually early period.

When the buccal cusps of the maxillary six-year molars, as they erupt, bite in the central groove of the mandibulars, on one or both sides, I institute treatment to correct this condition. I have never seen normal growth relieve this condition, and the locking prevents the maxillary teeth from following the trend of normal growth at this period. This treatment takes only a few months. I then remove the appliances and do nothing further until the time at which I would begin treatment of the average case.

We usually find, in cases in which growth has gone wrong early, as with the occlusion of the six-year molars, abnormalities will be present in the teeth *which erupt later*.

When the maxillary teeth bite inside the mandibulars, at an early age, I move them labially. When the maxillary anterior teeth protrude to such an extent that the lower lip is habitually held between the lingual surface of the uppers and the labial surface of the lowers, I treat early. When the mandibular permanent anteriors bite into the gingiva behind the maxillary anteriors to such an extent that the upper anteriors are forced labially, the gingival tissues are being injured or, as sometimes happens, both conditions occur; we place an appliance in order to relieve these conditions. However, when done early, treatment frequently must be repeated.

All of these procedures take little time, relieve a condition which would interfere with the trend of growth at that age, and are the only treatments given until the next step in treatment presents itself.

Let me try to give my reasons for believing that treatment of the deciduous teeth accomplishes nothing but sometimes does harm. First, any change we make in the alveolus of the deciduous teeth does not seem to influence the permanent alveolus. The alveolus of the deciduous teeth develops as they develop and resorbs at the same rate that the roots of the deciduous teeth resorb. As the permanent teeth begin to form, their own alveolus supports them. Its development is synchronized with that of the teeth. This being true, how can we hope to influence the positions of the permanent teeth by treatment of the deciduous teeth?

The teeth can only assume positions to which the alveoli carry them, and if the permanent teeth have a separate and distinct alveolus, how can treatment of the deciduous teeth influence, in any way, the positions the permanent teeth will assume as they erupt?

In my early orthodontic career I followed the teachings of that period. Treatment of the deciduous teeth was advocated, but I found, in practice, that the only thing which happened as a result of such treatment was the premature resorption of the roots of the deciduous teeth. This early treatment had no influence in changing the positions of the permanent teeth, and I had to treat the cases again.

There is no permanency in work done on the first teeth and no transfer of possible benefits to the permanent dentition. Harm may be done by premature loss of the deciduous teeth. Therefore, if we can do no good and may do harm, why treat the deciduous teeth? It makes treatment extend over an unnecessarily long period of time because, although we may get teeth in perfect alignment rather early and, in many cases, they remain, we cannot *safely* dismiss a case until growth and development have been completed which is in the late teens and early twenties.

Having pointed out the time when we should *not* treat, let us ask ourselves when we *should* treat. We cannot name an age but can only speak in terms of individual development. Some second molars erupt at ten; others have not come through at sixteen. We select the time to begin treatment in terms of the child's dentition, not according to his chronologic age.

We must guard against thinking that simply because a case has been referred to us or because parents wish treatment started that we must begin a case. I start less than half the cases which come to me. The others are asked to return in six, eight, or ten months for further observation. I explain to the parents that there is a *right* time to start and that growth may correct some deformities without orthodontic intervention. Many cases are seen about twice a year for five or six years and, at the end of that time, present as nice an occlusal relationship as one could wish. Furthermore, by following this plan we are able to start treatment at the most auspicious time. Sometimes it is difficult to convince parents that treatment should be delayed but nothing is so gratifying as their satisfaction when, after following your advice, they see an ideal mouth without appliances ever having been placed. This treatment is not only good for patients; it is good for orthodontists; it makes them sleep well at night!

What, then, is the right time to begin treatment? Treatment, during the transition period, is unwise for the reason that so many changes are taking place with which we may interfere that treatment constitutes a danger and an interference with normal growth forces which are most active at this time. The deciduous molars and cuspids occupy a greater space than the permanent premolars and cuspids occupy. Consequently, there must be a change in the positions of the first permanent molars. The second permanent molars erupt at the same time as the premolars. In order to accommodate these teeth, there must be a lengthening of the body of the mandible.

The cranium completes its growth around the eighth to the tenth year but the face continues to grow from under the cranium in many directions until the mid-twenties. Facial growth is forward and downward. The alveolus develops as the mandible and maxilla grow, and changes in the occlusal development of the teeth take place. There is an elongation of the rami at the same time and, although it is often overlooked, there *must* be a corresponding change in the muscles, the temporomandibular joint and the ligaments which control this joint. These changes are ample reason for leaving the mouth free of appliances at this period.

While individual conditions vary, the primary changes which we are called on to make are surprisingly few. There is the condition in which the teeth are misplaced and grow in the wrong direction in the alveolus. There is the condition in which the mandible and maxilla are too wide, too narrow, too long, or too short in relation to the rest of the organism.

In correcting malocclusion, the only change we make is in the *alveolus*. We cannot, with orthodontic appliances, lengthen or shorten the mandible, and we cannot change the temporomandibular joint. The changes which take place in them are the result of *growth*, not of our treatment.

The period following the eruption of the premolars and second molars is the time when we can make the gross changes most advantageously.

It has been my observation in my orthodontic work that between the ages of 16 and 22 we see a rounding out and adjusting of the teeth and the face which gives something to the appearance of that face which we, as orthodontists, cannot give it. But this cannot occur if the teeth are held by a rigid retaining appliance!

Some of my most successful results have been obtained in patients in whom work was not *begun* until active growth was completed. I believe the reason for this is the fact that we are not competing with growth processes in our treatment. The constant repair and change which go on in all tissues, even after maturity, make treatment possible but the likelihood of our treatment going counter to the trend of growth forces in that individual rules out the hazard of earlier treatment. Furthermore, there are certain conditions which we cannot treat earlier because they do not become apparent until near maturity.

Having considered the question of *when* to treat, let us discuss the problem of *how* to treat.

I believe that the simplest appliances, used for the shortest possible periods of time, constitute the best orthodontic treatment. On one end of a tooth we place a machine known as an orthodontic appliance. On the other end is a living, growing, ever-changing tissue, part of a human being. Which is going to win?

The first thing which comes to some men's minds when they look at a crowded mouth is extraction. They reason, falsely, that there are too many teeth for the size of the jaw. They overlook the fact that the teeth are as large as they will ever be but the jaw will go on growing and developing until maturity. The mouth is just *one* part of the face. We must consider orthodontics in the light of the entire face and not of the oral cavity alone. We must have a long experience before we realize that we must visualize patients at 30, 40, and 50 years, and not just at the time they are under our care.

Take, for instance, the mouth in which teeth were extracted to make "room" for labially erupted maxillary cuspids. The face, in almost every instance, develops a sunken appearance below the nose. As the soft tissues lose tone, with the passing of time, ugly wrinkles develop from the nose to the corners of the mouth. We cannot treat the mouth as an entity but only as part of the face. A well-balanced face is far more important than an exact alignment of the teeth. While I object to extraction from an esthetic standpoint, it is also unwise because it upsets the occlusal relation of the two dental arches. When a tooth is extracted, the alveolus supporting that tooth goes with it and instead of having more room for the teeth, there is simply a smaller arch to accommodate the remaining teeth.

We often see mouths in which there is apparently no room for a tooth which is due to erupt. Often, in an amazingly short time, the developing alveolus makes room for it. The reverse of this is true when a tooth is extracted; the alveolus goes when the tooth is extracted and the space is soon eliminated by the contraction of the bony arch.

Another thing to remember is the fact that the fibers of the periodontal membrane form a continuous network connecting and supporting the teeth. These fibers allow the teeth a certain normal motion during chewing, but they prevent too great movement from side to side and do not allow too great eruption or depression of the teeth. The orthodontic world has not given the periodontal membrane sufficient consideration in orthodontic procedures. When a tooth is

extracted, this complicated network is broken. Teeth adjacent to the one extracted may tip; pockets may form and serve as forerunners of later periodontal disease.

All of these possible dangers should be enough to make a man hesitate to use extraction as a corrective measure but when we realize that we do not really correct anything by extraction we are fallacious reasoners, indeed, to continue such a practice.

Once we have decided to begin treatment, what kind of appliance shall we use? Any type which does not hold the teeth rigidly is satisfactory if properly used. I condemn fixed appliances because their construction and use are based on the belief that we can push or pull teeth to positions in which we wish them and hold them in such positions without doing harm.

Any appliance may do harm, but the kind with which many anterior teeth are banded increases the likelihood of decay. These anterior bands are made of such thin material that when force is applied to them, they are frequently pulled away from the teeth to a sufficient extent to permit food particles to become packed between the tooth and the band. Decay usually follows. This happens sufficiently often to constitute a real danger.

The danger of decay is apparent to the layman as well as the dentist but *unseen* dangers lurk in fixed appliances, dangers which are apparent only to one who considers the underlying tissues. The rigid holding of the teeth, the loss of normal function in chewing, and the extreme force which accompanies the use of such appliances lead to grave dangers. One is root resorption, another is the devitalization of the teeth, and another is the destruction of the crest of the alveolar ridge, leading to early gum recession. I have had patients come to me, following years of unsuccessful treatment with fixed appliances, to ask whether anything further could be done. When x-rays were taken, the condition of the roots of the teeth indicated the loss of the teeth in another five to ten years. To have to tell a patient that, after years of treatment and in spite of glowing promises, there is nothing which can be done to undo this damage and that the teeth are doomed is one of the most difficult situations in any man's practice.

The danger of root resorption is spoken of all too glibly by orthodontists. To speak with satisfaction of being able to cut down the number of such casualties in one's practice is unbelievable. These injuries reflect first, on the kind of appliance used; not always, but generally, of the fixed type. They reflect, secondly, on the way in which the appliances are used.

Any appliance in a mouth constitutes a certain interference with normal function. We *see* the good that appliances can do; we do not see the harm they may be doing to the underlying tissues until it becomes apparent too late. Therefore, simply in the interest of the patient's safety, let us have appliances in the mouth as little as possible. Place them only when you are reasonably certain that the change you wish to make is unlikely to occur simply as the result of normal growth and development. As soon as you have made the desired change, remove the appliances. Do this for several reasons. First, when appliances are off, they can do no harm. Second, they must come off sometime, so find out as soon as possible whether the tissues are going to be able to

maintain the change you have made. Third, remove them so that the tissues may recover from the effects of the pressure you have exerted with the appliances. If the pressure has been too great or too far in advance of normal development, the teeth may revert, to some degree, to their former positions. If the tissues have adapted properly to the change made, the teeth will maintain their positions and you will know *better* how to plan your next step in treatment. Furthermore, we have found clinically that the teeth move more rapidly after a period of rest than they do when treatment is continuous.

We cannot move teeth safely at the rate of speed which we may desire but only at the rate which the tissues will tolerate. After the appliances have been on for six months, remove them for three and see how much more satisfactory your progress will be when they are replaced. Of course, this is just an approximate statement of time. That varies with every case. All of you are familiar with the *disastrous* results of overtraining an athlete. The same thing applies in overtreatment of the oral tissues.

It is not only necessary to give the mouth periods of rest from appliances, but the same idea must be carried over to the periods when appliances are in the mouth. Adjustments should be infrequent so that changes are not made more rapidly than the tissues can tolerate them. After the appliances are placed and pressure has been applied, I do not readjust them for three or four months. If the lingual arch is used and pressure is exerted in the direction of normal growth, it is amazing to see the way in which the teeth continue to move away from the appliances, long after the force of the appliances has been spent. This is one of the reasons I use the lingual arch.

We hear a great deal about retention. This term should never have gotten into the orthodontic literature. It gives an incorrect concept of orthodontic procedures. It implies fixation. As a matter of fact, it is nothing more than a continuation of treatment and a stage in treatment, and it should be so understood.

If we have the right concept of what causes teeth to move and of the way in which we effect our corrections, we will find no need of "retaining" appliances. Their use is based on the fallacious theory that the tissues, bone in particular, are comparable to soft cement. Men believe that the teeth are moved through the yielding tissues to the desired positions and that if they are then held long enough in these new positions, the tissues will "set" around the teeth and hold them there. How can an *appliance* "retain" teeth? If treatment has been of a character compatible with the growth changes of the tissues no retention will be needed. If not, no amount of retention will hold the teeth in new positions. Sooner or later the appliances must be removed. The sooner this is done, the sooner you will know to what degree your treatment has been in the right direction.

If we see the truth—that we cannot move the teeth at 12 to positions which they would not normally assume until 18 to 25 years of age and expect them to remain—we will see how useless retainers are. How can we hope by *any* means to finish treatment on a mouth in which growth has gone *wrong* at an earlier age than normal growth completes oral development when *nothing* has gone wrong?

If we take the runt of a litter of pigs and give him every aid in feeding and care, we cannot expect him to outstrip the finest of his brothers and reach maturity sooner. Those who require orthodontic treatment are, to varying degrees, below the average in the rate and character of their development. How, then, can we hope to bring them to a satisfactory maturity sooner than a perfectly normal child will arrive there?

Another question I should like you to consider with me is that of missing teeth. What is the best procedure to follow in cases in which teeth are congenitally missing or have been lost at an early age? Years ago the answer was open spaces and insert artificial teeth. Today the consensus is that it is best, for the general welfare of the patient, to close the existing spaces and eliminate the need for artificial substitutes. In neither way can we produce an ideal mouth. It is a matter of selecting the best compromise treatment.

All of us know the sequence which usually follows the insertion of artificial teeth. They must be attached, by some means, to the adjacent teeth. No matter what type of attachment is used, some damage to the adjacent teeth results, over a period of time. Ultimately these teeth go and a more extensive denture is required. This is not always the case, but it happens in a sufficient number of cases to constitute a danger.

If the spaces are closed, this danger of further damage to the teeth is eliminated. True, the arch may be narrower, the interdigitation of the cusps may be interfered with to some extent but, after all factors have been considered, it seems the wisest choice for the patient's welfare over the longest period of time.

It is a procedure which is not difficult of accomplishment although it involves a long period of time because so much tooth movement is involved. But the results are most gratifying, and no patient is more grateful than the one who has been spared the necessity of wearing bridges throughout his life. The idea that we must preserve the normal arch regardless of any other consideration is fallacious. In dentistry, medicine, and life, we are often in a position in which the ideal is impossible to attain. We must then reason from every angle and decide what will do the least harm, what will serve best, and then arrive at a decision. I believe by closing spaces when teeth are missing this reasoning has been followed.

There is a problem which presents more difficulty for most of us than any other with which we must cope. It is the problem of closebites and deep overbites. In analyzing this question, the most important fact to remember is that muscle is the dominant tissue. Bone must conform to the length of muscle; the reverse is never true.

We cannot hope to elongate the posterior teeth and have them remain in the new positions, if these positions place a strain on the muscles of mastication. To increase the bulk between the jaws puts a strain on the muscles of mastication. There is, normally, a slight space between the occlusal surfaces of the posterior teeth when the jaw is at rest. When this is impossible because of increased bulk, the posterior teeth are gradually depressed until the strain on the muscles is relieved. I saw this in my general practice years before the fact had any orthodontic significance for me.

I do not believe that the true closebite in which the rami is short and the posterior teeth erupt very little can ever be changed. Fortunately, it is satisfactory from a functional standpoint, and it must simply be tolerated even though it is unattractive esthetically.

The condition which is often not differentiated from the true closebite is the deep overbite. The rami and posterior teeth are normally developed, but there is an exaggeration of the curve of Spee and the mandibular anteriors often bite deeply into the soft tissues behind the maxillary anteriors. Many have reasoned falsely that the posterior teeth should be elongated in such cases. They, however, are normally placed. The fault lies in the anterior teeth. I, therefore, depress the mandibular anteriors by means of small hooks attached to a lower lingual arch. The hooks go over the occlusal edge of the mandibular anteriors and exert a gentle downward pressure.

Bite plates are commonly used in this condition. I do not like them for the reason that any type of plate in the mouth of a developing child is injurious to the gingival tissues.

It is well not to undertake this treatment early except as a palliative measure because the correction seldom remains. However, when damage is being done to the gingival tissues, it must be undertaken. Many such cases improve naturally as they reach maturity. The thing to remember is that relief must be given the gingival tissues so that permanent harm will not be done.

We can give a great deal of comfort to older patients by depressing the mandibular anteriors if they are biting deeply into the gingival tissues of the maxillary teeth. In some cases, the result seems to be permanent after having been done once. If the tissues are in poor condition, especially the alveolus, it may have to be repeated at intervals over many years. This may seem unsatisfactory, but, when we realize that by doing this we enable a person to retain his own teeth in comfort, it becomes a very worth-while procedure.

Let me try to sum up the things I have tried to bring out. First, and most important, *growth* is our orthodontic problem, *not* teeth. The individual must be the dominant consideration in all our thinking and reasoning. The appliance is the simplest part of our work. We must remember that we cannot fit the patient to the appliance but must fit the appliance to the individual. Appliances can do much harm and no good unless they fit in with the normal growth processes of the patient. We must remember that the teeth, themselves, are all right. They assume abnormal positions and relationships not because of something inherently wrong with the teeth, but because the other tissues have not followed the normal growth pattern. No one tissue is at fault. The tissues are so interdependent and their growth is so synchronized that their development must be a harmony of parts even when the resultant oral cavity does not measure up to our standards of ideal form.

If we wish to render the best service through our orthodontic work, we must be ever alert to sift fact from fallacy. Too often, a half-truth sounds attractive. A procedure may look easy. Rapid treatment sounds desirable; continuous treatment may seem to promise earlier completion of cases; and extrac-

tion would seem to be a short cut. Our individual practices and our profession, as a whole, will not progress until we face facts and put out of our minds and practices such illogical thinking.

Unfortunately, we must practice a goodly number of years in order to see what happens as the result of different modes of procedure. Our errors of today may not become apparent for several years. It is because I have practiced a long time and have seen thousands of cases that I feel my observations may help you.

1520 SPRUCE STREET

ORTHODONTIC OBJECTIVES

ANDREW FRANCIS JACKSON, D.D.S., F.I.C.D., PHILADELPHIA, PA.

"A concept which cannot be translated into terms of experience or practice is meaningless." (William James)

IT IS estimated that there are over two billion human beings on this terrestrial sphere; every one of them different—unique in the infinite combinations of their component elements. There are millions of ideal or perfect occlusions; each different in size, proportion, orientation, and every other combination of its numerous factors. There is probably a larger number of imperfect occlusions, some of them extremely unsatisfactory. An orthodontist's lifetime effort is spent in endeavoring to convert some of these unsatisfactory occlusions into more desirable ones. As there is no such thing as exact duplication in nature, particularly with anything so fantastically complex as the human organism, it is obvious that the terms "ideal," "normal" are purely relative and not interchangeable as far as individuals are concerned. More sweat, blood, and tears have been shed over this misconception than probably anything else concerned with orthodontics.

As it is obviously the fundamental law of nature that every individual should be unique, it is not much wonder that the problem of predetermining the "Individual Normal" has been a windmill against which more than one well-meaning but quixotic orthodontist has tilted an ineffectual lance. Any attempt to standardize the individual, either orthodontically or otherwise, is a false lead which confuses a clear concept of the facts and winds up in pitfalls and dead ends.

There are fortunately, however, broad and comprehensive objectives capable of embracing every possible variation of the individual by which he can be judged and a clear concept obtained of the changes that may be possible and desirable. The bitter personal experiences and mistakes caused mainly by attempts to adhere to the stuffy confines of an ill-founded and myopic classification are the reasons to emphasize this as the first, most important, part of any orthodontic consideration.

Orthodontists can take comfort and profit by the thoughts of others engaged in fields of effort, just as complex, if not more so, than our own. There is nothing more complex in the universe than human personality. The whole tissue and substance of orthodontics is intimately related to all of its anatomic, physiologic and psychologic intricacies.

While writing his *Principles of Psychology* William James had this to say: "The experimental methods, the biological conceptions, and the pathological extensions of the field have introduced a period of chaotic fermentation from which some writers have profited by developing one-sided crudities in a very confident way.

Read before the Great Lakes Society of Orthodontists, November, 1941.

"I have expressly avoided the outward appearance of doctrine and system, the definitions, classification, subdivisions and multiplication of technical terms, because I knew that these things tend to substitute an artificial schematism for the living reality with which I wished to bring my reader into direct concrete acquaintance, whether he should have technical names to call its parts by or not."

I have never found, in two short paragraphs, more perfect English to express my own personal lack of enthusiasm over the gnathostatic system. Practical reasons for this will be shown later under Treatment.

Nearly all problems, particularly those of a complex nature, can be simplified by clear statement—in fact the statement often suggests the solution.

In previous papers I have called attention to the fact that the objectives of orthodontic treatment can be quite clearly and simply defined as structural balance, functional efficiency, and esthetic harmony, and that these three objectives form a natural classification under which the factors which must be considered in every case can be listed and judged with clarity and directness, both singly and in their relation to an all-inclusive whole. I do not claim any originality in this matter—simply emphasis and arrangement. It has served my own purposes better than any other scheme.

In its broad sense, nature is completely incomprehensible to man's finite mind. Science is merely a matter of observation, comparison, and deduction, much of it, unfortunately, entirely too superficial to be of permanent value. Our entire lives are spent in making decisions based on:

The unknown and unknowable.

The unknown but strongly suspected.

The known.

The human intellect flounders out of its depth.

Judgment might be defined as cultivated guesswork. Common sense is still one of the least overworked of human qualities.

All activities in life can be divided into two great groups. Those concerned with the vital activities of living tissue and those concerned with the rearrangements of inert matter. It is absolutely fatal to confuse their laws and reactions. The first can never be reduced to the slightest semblance of an exact science while the latter has possibilities in that line. The latter is subject to the laws of mathematics, chemistry, physics, etc. Of course when ancient astronomers woke up to the fact that the world was round instead of flat, it created an entirely new viewpoint on the subject and probably made a few dogmatic individuals, who undoubtedly have existed in all ages, look rather ridiculous. Some rude awakenings are still very much to be expected in orthodontics.

That orthodontics is still in a rather primitive state of development is quite evident by the intolerant differences of opinion among orthodontists, both in regard to fundamental concepts and the ridiculous preferences and prejudices in regard to the selection of appliances and other means of procedure concerned with making the changes which seem desirable.

At no time is clear thinking more necessary than in the consideration of fundamentals at their source. When the objective has been clearly defined, the means to accomplish it should be in logical harmony. Every physical effort proceeds to its objective in a series of correlated steps, each dependent on the

other, but none of them quite predictable. This is a fundamental law of nature which can no more be evaded than death or taxes. In all sensible efforts men have devised tools to perform the work of the moment, changing quite naturally to something different, if necessary, to accomplish the next step. Golf is easy to understand but difficult to play. It can be played with only a driver or only a putter, but it would be foolish to do so. It is just as illogical to hang doggedly to one type of appliance in orthodontics when something different can accomplish a particular movement much better. Among their good qualities, orthodontists are, as a whole, extremely ingenious but the universal appliance is no more in evident than the universal golf club.

With these opening remarks as a philosophic background, this paper is devoted to the proposition that structural balance, functional efficiency, and esthetic harmony constitute final objectives for each individual case; that each result will invariably be unique and that in order to obtain these results there is every scientific reason to make every compromise with so-called "ideal occlusion" which the *possibilities* and *limitations* of the case dictate.

A separate consideration of these objectives will be made and their applicability discussed in the treatment of a number of cases of a widely divergent nature.

STRUCTURAL BALANCE

Every human being is a result of a combination of two fundamental elements, heredity and environment. It is necessary, therefore, to have some concept of what relations they bear to each other and the individual. On this basis alone can an estimate be made of the changes which it may be desirable to attempt.

It is not necessary for an orthodontist to be a geneticist in order to appreciate the results of heredity (geneticists disagree among themselves on the subject). The results of propagation and selective breeding are so obvious in the lower animals that they contain logical irrefutable implications applicable to man.

In accordance with fairly well-established laws of heredity, different types of the same species of animal have been produced. There are many types of dogs and horses; there are also many races and types of human beings. It is logical to expect that the progeny of two Great Dane dogs would be Great Danes with all the characteristics of that type and that with the proper environment they would develop normally to the stature of their parents. The same would be expected from the pure breeding of any of the other types down to the smallest. *Crossbreeding* produces results which are entirely different and quite unpredictable as far as any specific individual is concerned. This is probably the most important single fact in the whole concept of orthodontics.

Geneticists inform us that the combination of the genes of the male and female in the human species are capable of producing an astronomical number of combinations in the offspring. These combinations may be satisfactory or very unsatisfactory, as the case may be. This is the underlying factor which produces totally different combinations in the same family. From the orthodontic standpoint these combinations may be unsatisfactory in the proportions of tooth substance and bone, unsatisfactory in the orientations of the dentures

to the skull, and unsatisfactory in the proportion of the dental organs to the other facial factors. In this matter the terms *ideal* and *normal* are purely relative.

The physical characteristics of any individual hybrid are, to a great extent, pure accidents of heredity.

Bernard Shaw has stressed the genuine value of the ridiculous to emphasize the truth. Fig. 1, which is from a cover of *The New Yorker*, is a picture which no orthodontist should be without. (I am indebted to Dr. LeRoy Johnson for the idea.)

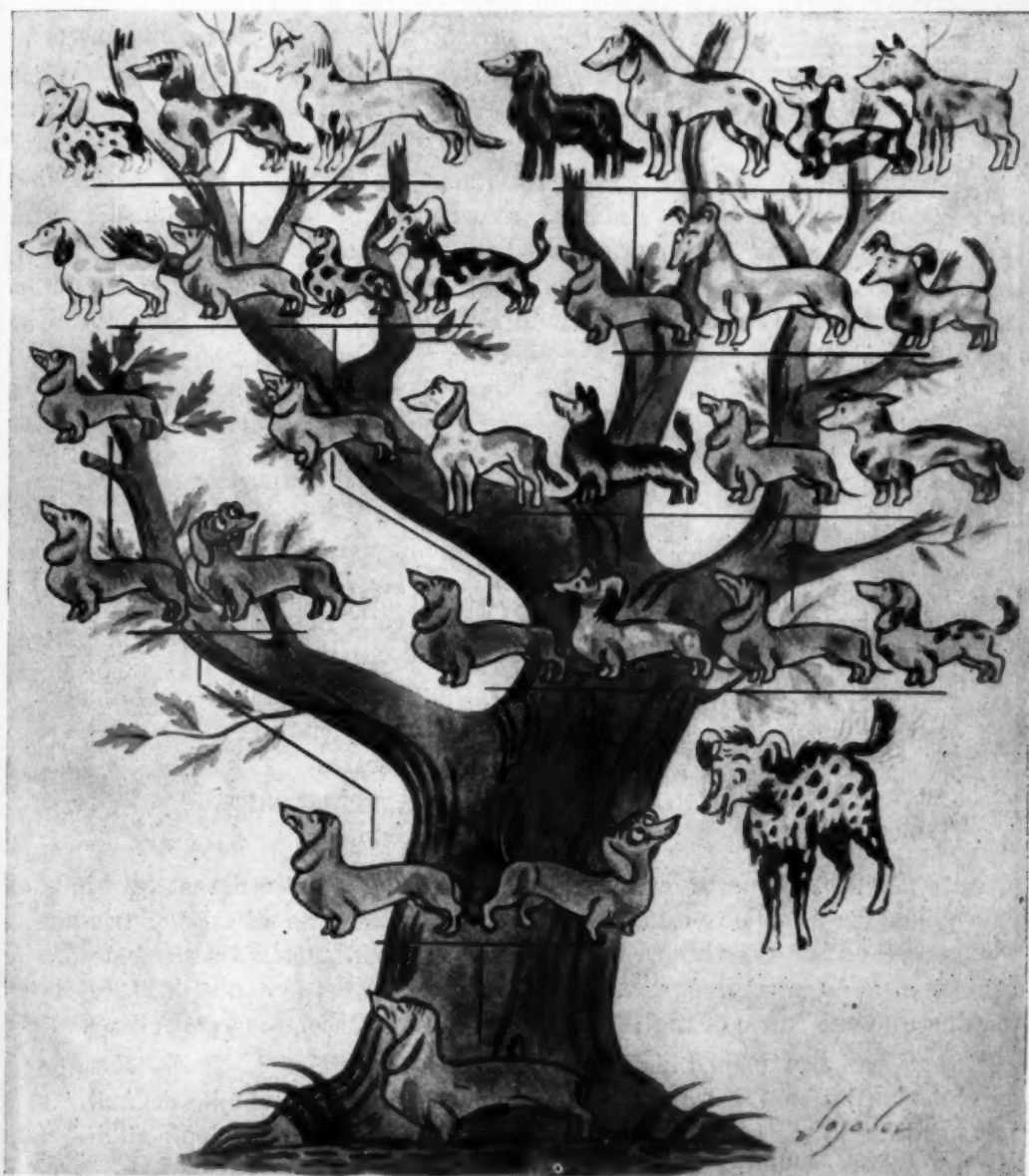


Fig. 1.—(Courtesy of *The New Yorker*.)

The fundamental truth which it actually represents helps to highlight some of the nonsense and misguided effort which has been wasted in some lines of orthodontic endeavor.

Every orthodontist has had to sit through, or perhaps sleep through, long ponderous statistical papers on growth and other developmental factors. To alleviate the usual tedium, masses of figures and graphs have been prepared and the "wiggles" of the graphs studied. A composite line of the graphs is usually made and called *average*. A fatal mistake of concept is thus often created in the mind by confusing *average* with *normal*. An individual may be the exact average of a group and be quite unsatisfactory, but others in the group may be quite normal within a large range of variability. The material for making these studies is taken, usually, from children at institutions. If there were any homogeneity in the heredity of these children this method would have great value, but in actuality it could be compared to making developmental comparisons between a number of puppies of different breeds, some of them Great Danes, others Spaniels, Fox Terriers, and perhaps a Chihuahua or a Mexican Hairless thrown in for good measure.

The other half of the story—environment—is just about as complex and undeterminable as heredity. The implications of each can never be disassociated. Opinion in this matter is so controversial that it would be interesting and amusing to submit the following list to a large group for marking with plus or minus signs opposite each factor, according to their own opinion. My own would be something as follows:

HEREDITY		ENVIRONMENT	
Bodily size	+	Bodily size	-
Bodily proportions	+	Bodily proportions	-
Jaw sizes	+	Jaw dimensions	-
Jaw proportions	+	Jaw proportions	-
Jaw relations	+	Jaw relations	-
Teeth sizes	+++	Teeth sizes	---
Teeth number	+++	Teeth number	---
Teeth relations	+	Teeth relations	-
Nutrition	-	Nutrition	+++
Diseases	-	Diseases	+
Temperament	+	Temperament	-
Habits	-	Habits	+

In efforts to bring order out of chaos, it is only natural that all kinds of efforts have been made to establish some sort of scheme as a basis for treatment. The acceptance of any theory, however, not in accordance with the facts of the subject is the greatest danger to which the orthodontist is exposed. It is better to adhere to one ounce of undefinable truth than a ton of concrete fallacy.

Some wag has defined history as "fables agreed upon." Nearly every book on orthodontics contains a nice little rigmarole, which might be defined under this heading, in which it is implied, at least, that if all the developmental factors are taken care of during childhood and adolescence the result should be a perfect correlation between the volume of tooth material and jaw development. The most casual clinical observation will show that this is utterly fallacious. It is a matter of everyday occurrence to observe some big strapping fellow with every appearance of perfect development, who, by some accident of heredity, has nar-

row constricted arches with perhaps very large teeth and, it is equally common to observe some underweight, emaciated-looking young girl with beautifully developed arches and such small teeth that there are spaces between them which an orthodontist is at a loss to know how to close. Fig. 2 is just one illustration of this.

This is no argument against doing everything possible to promote optimum healthy development in every case. Structural balance constitutes one of the most natural headings for a sound and reasonable classification because the whole object of classification is to clarify the mind on the decisions which must of necessity be made for a successful result.

In view of these facts there is not only sufficient reason, but an imperative necessity in many cases, of making every conceivable form of compromise which the possibilities and limitations of individual factors determine as the final object of treatment.

The clinician is perforce obliged to depend mainly upon his experience in clinical observation to make the tremendously important decisions which arise in cases which involve this problem. In this respect much valuable information can be gathered by a painstaking study of the gross physical characteristics of the individual. The apical bases of the teeth are of the utmost significance in this respect as only by their positions and relations to the basal bone can the amount of tooth movement be reasonably estimated. Studies of models alone can be exceedingly misleading in this respect.

The bony substance of the jaws is composed of basal bone and alveolar process; these two substances vary greatly in both volume and proportion to each other in different individuals. This is one of the reasons that accounts for the very great difference of resistance to tooth movement which exists between individuals, and the obvious limitations of tooth movement in some cases.

The size and shape of the basal bone cannot be altered very materially by treatment, as this is determined predominantly by the genetic factor. The disposition of the alveolar process can be changed quite considerably by mechanical means, but if the alveolar process is so changed as not to conform proportionately with the size and shape of the basal bone, no very permanent result can be expected. The possibilities and limitations of treatment are, in most cases, quite definitely determined by the shapes and sizes of the maxilla and mandible, and the best compromise which can be made in the arrangement of the teeth to each other, depending on these factors. A large proportion of the failures in treatment have been due to a disregard of these facts in efforts to obtain so-called ideal occlusions, which, in many cases, are impossible of attainment, and entirely unsatisfactory to the facial balance.

In some cases the congenital absence of teeth, the extreme displacement of certain teeth, and other factors are such that not only is ideal occlusion, but even a satisfactory occlusion, obviously impossible of attainment. As long as the orthodontist has obtained the optimum which the individual factors permit, he has done his full duty by the patient. Just what this is, is extremely difficult to determine as individual factors make fixed standards impossible. The application of ordinary common sense in a careful study of individual details, however, is often all that is needed to indicate quite clearly what may be estimated as the

most desirable individual objective. If judgment is bad in this matter, no power on earth will prevent cases from being failures.

An orthodontist is in the position of an umpire in these matters. Some decisions are very easy to make, others very difficult. Umpires get "pop" bottles thrown at them on close decisions. Fortunately an orthodontist can change his mind if he finds by experience that he is wrong. It is said that only a fool never does.

Adhering to a preconceived theory in this matter is probably the reason why Brash should have remarked that in one respect, at least, Angle has rendered orthodontics a distinct disservice. There is no reason, however, for blaming that truly great man for an opinion about which he undoubtedly would have changed his mind were he living today.

In many cases, a satisfactory structural balance can be obtained only by the extraction of teeth, and the time is now past when it is necessary to make any apology for a means of treatment which is sound scientifically and, in many cases, a categoric necessity.

FUNCTIONAL EFFICIENCY

Functional efficiency depends upon a relation of the teeth to each other and their orientation to the skull as a whole, that will permit of a satisfactory excursion of the mandible in the function of mastication. The ideal positions of the teeth to each other are well known and accepted, but their relative positions to the skull are still quite hazy.

The positions of the teeth to the skull have sagittal, anteroposterior, and vertical relations. What the composite of these three should be to the skull is as yet problematic, but it is logical to infer that it should be quite as variable as the characteristics of the individual himself. Of the three dimensions it is obvious that the sagittal positions of the teeth should conform as nearly as possible to the median sagittal plane of the skull. To determine this median sagittal plane, however, is not easy, if at all possible. This is not vital either for functional efficiency or for esthetic reasons, and furthermore, in most cases, cannot be altered to conform to any such ideal by any purely intraoral forces. It is quite obvious that it would seldom, if ever, be desirable to employ extraoral force for this purpose. The same argument holds good for the other two planes. Nature herself does not seem to adhere to any mathematical precision in producing her individual specimens, so why should an orthodontist concern himself too seriously about such matters? Of the many theories on the subject of orientation, it would seem that an arrangement which conforms to the curve of an arc or segment of a sphere seems about as logical as any, as this arrangement is the most efficient from the standpoint of function and appears to be the most pleasing from the standpoint of esthetics.

When the main problem is a question of the relation of the jaws to each other, the question is, to a great extent, determined from the functional standpoint, by the possibilities and limitations of the psychic reactions and muscular control of the patient. The world is full of examples of individuals who have completely changed their physical characteristics or endowments by sheer will to do so. The ability to change the relation of the jaws to each other is by com-

parison one of the easiest changes that can be made in the human anatomy and is best accomplished by an inspired desire to do so on the part of the patient, the seed of which can be planted by the orthodontist. Not to realize this is to throw away one of the greatest means of treatment. In order to accomplish this to the best advantage, however, it is in most cases desirable to make some changes in the position of the teeth so that this can be accomplished with the greatest ease, as the patient will always function naturally in the position of greatest comfort. A study of the functions of the individual and the disposition of the teeth will usually disclose what these changes should be with such clarity that they are often of almost ridiculous ease of detection. The use of appliances to act as reminders to alter function is of the greatest value.

A great deal has been written on the subject of the orientation of the teeth and jaws to the cranium. In order to make scientific comparisons, the most stable bony landmarks have been selected, and some very interesting unilateral comparative graphs made on flat surfaces during development and also of "before" and "after" treatment. Some of these changes appear extremely plausible, but in most cases they represent only a part of the picture. The position of the mandible to the skull is a three-point suspension mechanism; the two condyles and the opposition of the teeth. The three-point suspension mechanism is used to attach motors to automobile frames because it permits of an infinite number of movements in their relations to the frames. The movements and relations of the mandible to the skull are also infinite in number.

It is difficult, if actually possible, to x-ray accurately a temporomandibular articulation from a flat lateral angle. There are two condyles to be considered, however, and from a lateral view the condyles and the sella turcica, as a bony landmark, are at different distances anteroposteriorly from the x-ray machine. In order to make comparisons of actual value it is necessary to make three-dimensional pictures including both condyles and the bony landmarks, all of them located at different three-dimensional positions in space. This imposes such great difficulties of execution that it is of dubious practical value in an organism which is undergoing change.

The problem in itself is such a vital one to the orthodontists that there is a crying need for a simpler and more practical method of determining the actual changes that take place when intermaxillary force, for example, is employed.

The use of intermaxillary elastics is one of the greatest aids in treatment, but they can also produce disastrous results if unwisely employed.

ARTISTIC HARMONY

Artistic harmony is a question of proportion in the shape, size, and orientation of the dental organs as a whole in their relation to the other facial factors. Beauty is indefinable, but one of its main attributes is a correct proportion of its component elements. This is an artistic problem of such a subtle nature that it is questionable if its objectives can ever be definitely measured and estimated in scientific terms for orthodontic purposes.

In this, again, the orthodontist is faced with the limitless combinations which the component elements of an entire head and face are capable of producing. It is not only desirable, but absolutely necessary at times, to make

every conceivable compromise which structure and function will permit in order to obtain the most desirable results. Bony anatomic landmarks are purely relative in value and are not much help from the artistic standpoint which, in facing its problems, must of necessity include all the soft tissues of the face with all their peculiarities of size and form. There are cases which have come under my own observation in which the structural balance and the functional efficiency could be considered satisfactory, but in which the artistic harmony was anything but satisfactory, offering problems of the utmost difficulty of solution.

TREATMENT

One of David Starr Jordan's favorite remarks was, "Wisdom consists not so much in knowing what to do in the long run as to what to do next." It is hardly possible to think of any one single idea which is more appropriate to the problems of orthodontic treatment.

Regardless of how much an orthodontist might wish it otherwise, he cannot possibly evade the fundamental law of nature that all vital processes proceed to their objectives in a series of correlated steps, each dependent on the other, but none of them quite predictable. As action is followed by reaction, a complete re-evaluation of the situation is a categoric necessity at each visit, and depending entirely on the changes which have taken place in the interval should the decision be made to continue with the methods or appliances in use, or discard them for something entirely different, either because the effect has not been what was expected, or that the change which has taken place suggests something more suitable for the next move.

Disregard of this fundamental is responsible for some of the most disastrous results.

Treatment is based on strategy from start to finish.

The simplest, most direct method to determine each successive step is to get the patient to place the jaws in the relation of "occlusal advantage" and in this position study the mechanical interferences and inhibitions which prevent the patient from doing so habitually. The clarity with which this simple expedient will disclose the actualities is worth a volume of theorizing.

There is no such thing as specific predetermination at any stage in treatment. There are only a number of *general principles* applicable at all times to all cases. In addition to the first and most important just mentioned, the following should ever be borne in mind.

The relationship of the jaws should always be considered from the standpoint of a unit, and individual movements of the teeth in one jaw should never be undertaken without careful calculation for compensatory and complementary movements of the teeth in the opposing jaw.

These movements should always be carried on simultaneously so that at all times during treatment there will be a minimum amount of trauma.

All rearrangements of the tissues should be considered simultaneously from the vertical, sagittal, and horizontal planes.

Due to the ingeniousness of orthodontists in general, there is a very great variety of appliances, among which there is a great deal of duplication in principle. Every orthodontist should be thoroughly familiar with the technique

and application of at least several varieties because it is quite obvious that the application of some is infinitely more suitable for some situations than others.

If there is ever to be any homogeneity of treatment among orthodontists, it can be accomplished only by clear demonstrations in clinical results of the merits of the means employed.

In supplementing this presentation with a token of case reports, the only purpose is to offer some ideas of correlation in concept and treatment.

From a comparison of the methods employed in these different cases, it is possible to make some valuable deductions.

Figs. 2 and 3 are just two examples of the comparative differences in proportion between the amounts of tooth substance and bony development. These are infinite both in numbers and degrees.

Fig. 2.



Fig. 3.



Fig. 2.—Large teeth, inadequate bony development.

Fig. 3.—Medium sized teeth, ample bony substance.

As a result of hybridization it is *natural* that every conceivable combination of proportions between the volume of tooth substance and bony development may occur. It is only *possible* for an orthodontist to make tooth rearrangements where there *happens to be* the bone to make them in. This comes before every other consideration, and if this basic principle is adhered to in every instance, many futile efforts and idiotic mistakes would be avoided. It is possible to make just as many satisfactory rearrangements or *reasonable* compromises as there

are individuals in the world with malocclusion, and it is just as illogical not to consider the expedient of reducing the tooth volume by extraction as it would be to consider employing methods to inhibit growth and development in childhood and adolescence when there is obviously going to be an overabundance of bone for the tooth volume present.

The possibilities and limitations in this respect are so infinite and so varied that they are quite beyond the limits of laying down any specific rules regarding the relations of the teeth to each other or other bony landmarks. In treatment the less the imagination, common sense, and judgment are hampered by any false sense of reliance on ill-founded theories or schematic formulas, the better are the results likely to be.

When a malrelation of the jaws exists, a comparison of the natural condition of malocclusion which is present with the teeth and jaws placed in a position of "occlusal desirability" will also produce as many different pictures as there are individuals with malocclusion—a few paltry million.

These pictures, taken from the living subject, constitute the "living realities" with which we *have* to deal and are the most reliable guides to indicate the changes which may be desirable and the methods or appliances that may be most reasonably employed in order to obtain them.

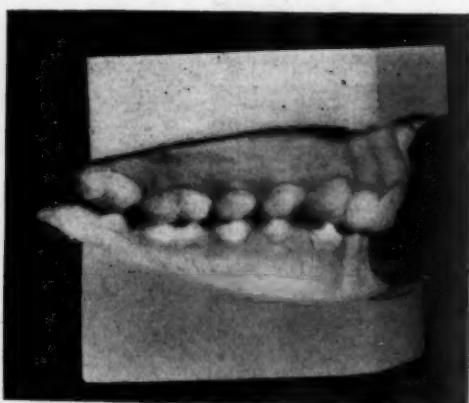


Fig. 4.



Fig. 5.

Fig. 4.—Models of case shown in Fig. 5.

Fig. 5.—Biting in position of "occlusal advantage," giving a true picture of proportion, relation, and orientation.

Fig. 4 is a photograph of quite an ordinary and innocuous looking set of models. Fig. 5 is a photograph of the individual from whom these models were taken, biting in the position of "occlusal advantage." This presents a picture of the specific "living reality" with which we are concerned, like nothing else can. In many cases in which the mesiodistal relation is concerned, the disclosures revealed by this simple procedure are startling and healthfully disturbing. This one is no exception to the rule. It does not take much imagination to note that the vertical readjustments of the *bony segments* that must be made to produce a good occlusion, indicate that the treatment of this case is not going to be an easy matter.

Figs. 6 and 7 are photographs of teeth in positions of malocclusion and "occlusal advantage." A million different individuals would present a million different pictures but in every case they are the most reliable guides as to what changes are indicated and what types of appliances best suited to accomplish the desired results. The individual is not standardized, why should the appliances be?

Fig. 6.



Fig. 7.



Fig. 6.—Position of natural malocclusion.

Fig. 7.—Teeth in Fig. 6 biting in position of "occlusal advantage."

Figs. 8 and 9 are photographs of an individual biting in his natural position of malocclusion and also in his own peculiar position of "occlusal advantage." A comparison of these with models is like making a comparison of the proverbial views of the trees and the woods. Personally if I had only one choice in the selection of either models or photographs of this kind for purposes of diagnosis, I would discard every model I possess nor feel that I had suffered any great loss whether I had gone to the trouble of making them gnathostatically or not.

Fig. 10 is shown because it is an exceedingly common condition, in the treatment of which there is a considerable difference of opinion among orthodontists.

Fig. 12 shows this patient biting in the position of "occlusal advantage" with a vulcanite bite plane in place in addition to the fixed appliances which

are shown. Using bite planes in conjunction with intermaxillary elastics in cases of this kind is like disengaging the clutch while changing gears. Fig. 13 shows this same case about three months later. At that time it was physically impossible for this particular patient to bite in the original position of disocclusion and the bite had opened sufficiently to make the retraction of the incisors an easy matter, by means of the auxiliary springs, shown in Fig. 11.

Fig. 8.



Fig. 9.



Fig. 8.—Natural position of malocclusion.

Fig. 9.—Teeth in Fig. 8 biting in position of "occlusal advantage." Comparative photographs like this convey a much truer record of the "living realities" than can be obtained from models whether they be made gnathostatically or not.

It would seem logical that the simpler the appliances and the more the voluntary muscular efforts of the patient are enlisted, the more natural should be the treatment.

Fig. 12.

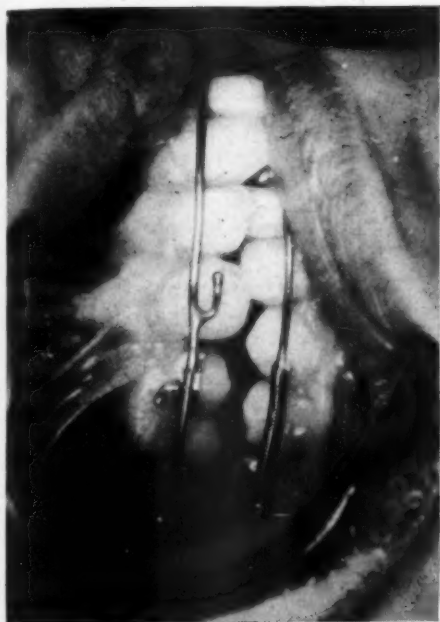


Fig. 13.

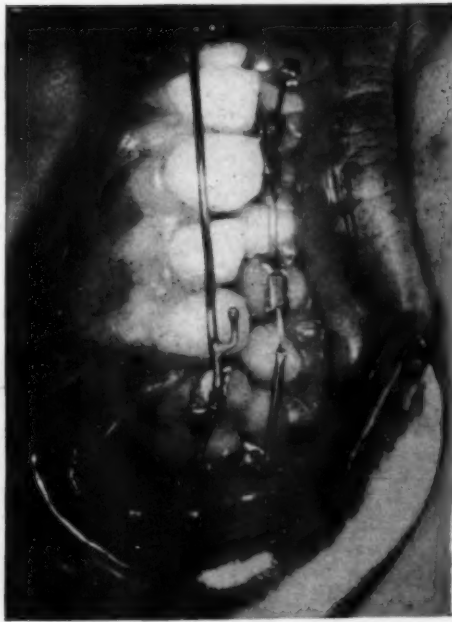


Fig. 10.



Fig. 11.



Fig. 10.—A very common type of malocclusion.
 Fig. 11.—Same case as Fig. 10 after treatment with bite plane and intermaxillary elastics. The incisors were retracted after the bite had been altered sufficiently to do so without traumatic occlusion.
 Fig. 12.—Same case as Fig. 10 with fixed appliances and bite plane in place.
 Fig. 13.—The same case as Figs. 10 and 12 a few months later.

Figs. 14 to 20 show the models and facial photographs before and after treatment of a case of distoclusion, linguoversion of the maxillary first molars and deep overbite. The treatment was conducted in a manner similar to that which has just been described and illustrated, using a series of bite planes as the treatment progressed. A lingual arch was used in the lowers. Just exactly what changes have actually taken place I do not know any more about than the next fellow, but it is my opinion that the movement of the teeth in the alveolar process constitutes the lesser degree of these changes. There is absolutely no telling how a case of this kind will react to treatment regardless of how similar models of this type may look, but in some cases the changes are so rapid and so positive that it is inconceivable that the changes are mainly in the alveolar process.

Fig. 15.

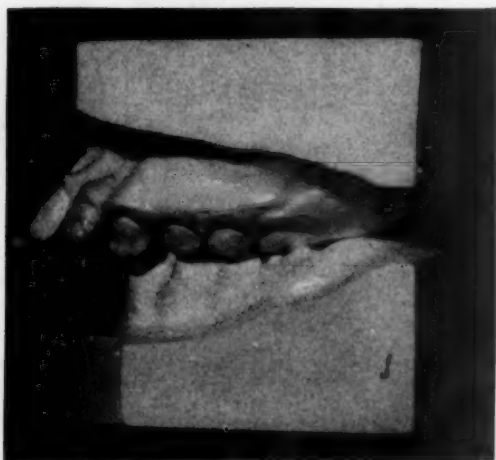


Fig. 14.



Fig. 16.

Figs. 21 to 25 show the original models and facial photograph of a case of complete distoclusion of the right side, partial distoclusion of the left side, linguoversion of the left mandibular premolars and deep overbite. As can be seen by a study of the models, there is good structural balance in the maxilla but poor structural balance in the mandible. This does not make a happy combination. In this case a simple labial arch with premolar supports as illustrated was again used on the maxillary teeth and a Johnson twin-wire appliance on the mandibular teeth. The Johnson twin-wire is ideal for cases like this where the benefits of reciprocal force between numerous teeth can be employed. Figs. 26 and 27 show progressive stages during treatment. Figs. 28 to 31 show the result of treatment and the appliances. Notwithstanding the fact that the deep

Fig. 19.



Fig. 20.



Fig. 19.—Before treatment.
Fig. 20.—After treatment.

Fig. 17.



Fig. 18.



Fig. 17.—Before treatment.
Fig. 18.—After treatment.

overbite was very similar in appearance to the one in the previous case, no bite planes were used in treatment. The changes in the intermaxillary relations made this unnecessary as can be observed in the illustrations. Where changes in the jaw relations are involved, the reactions to treatment are quite unpredictable and make it necessary for an orthodontist to be as alert as to what is taking place as if he were sitting on the back of a bucking broncho. The greatest danger lies in producing a condition of open-bite, one of the most unfortunate and unforgivable results that can occur. In this respect lingual arches should be used only where the depth of the overbite makes their use entirely safe.

Now the problem arises: Has this case been correctly treated or should some compromise objectives have been attempted? It is doubtful if a thoroughly sat-

Fig. 21.

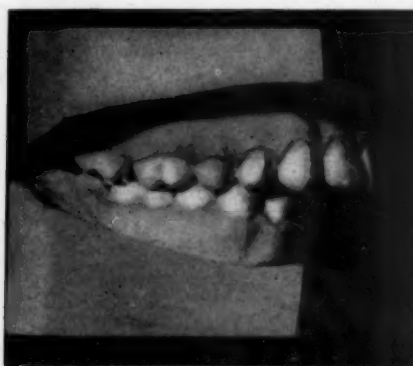


Fig. 23.

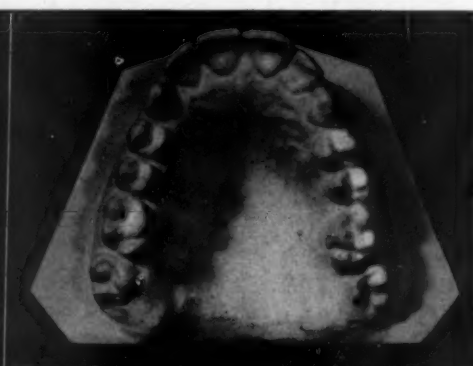


Fig. 22.



Fig. 24.



Fig. 25.

Fig. 28.

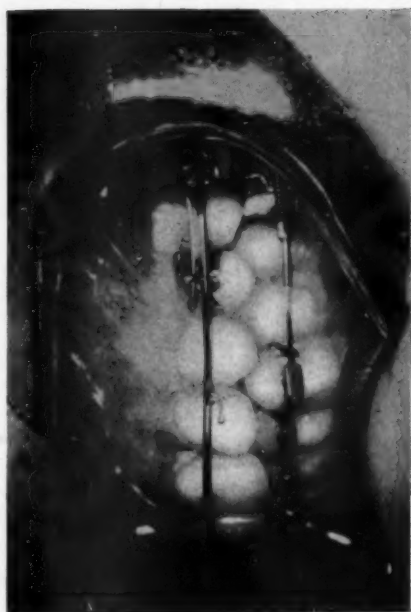


Fig. 29.

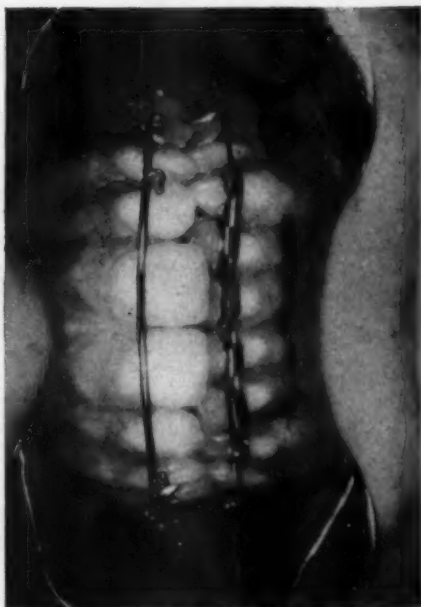


Fig. 26.



Fig. 27.



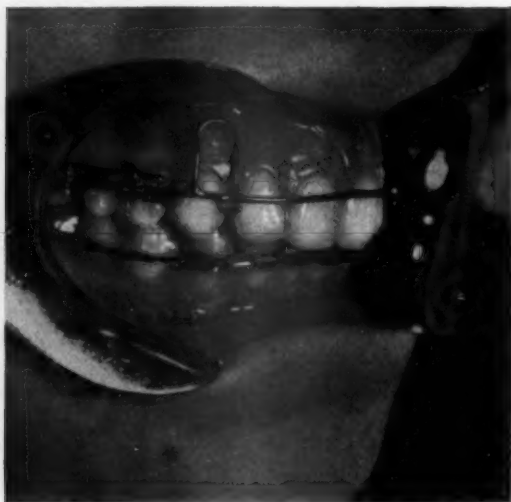
isfactory structural balance can ever be established with a full complement of teeth in the mandible. The removal of two premolars in the mandible would also necessitate the removal of two maxillary premolars which is quite obviously contraindicated. The Ancient Greeks had oracles to consult!

I realize that both these cases could have been treated with completely mechanized appliances and Panzer tactics. Some of the present ideologies of treatment seem to be as widely divergent as the concepts of totalitarianism and democracy.

Fig. 30.



Fig. 31.



Figs. 32 to 34 represent a case which is exactly the opposite of the one we have just discussed. The mandible in this case is overly developed in proportion to the maxilla. This can be gathered not so much from a study of the models as from a study of the patient. Without consulting any oracle the maxillary right first premolar was extracted and a rearrangement of the teeth, as illustrated in Figs. 35 and 36, was made, employing the Johnson twin-wire appliance. In

this way the three primary objectives, I believe, have been obtained in the simplest and most efficient manner, without involving the risk of attempting an ideal objective in which the dangers of getting into trouble far outweighed the benefits which might be derived. Incidentally the teeth in this case moved as if they had been set in concrete. His mother explained this by saying that it has been his habit from a child to drink between three and four quarts of extremely rich milk each day. There was sufficient clinical evidence to show that he was not deficient in calcium metabolism!

Fig. 32.



Fig. 33.



Fig. 34.



Figs. 37 to 43 show models and facial photographs of a case which involved an artistic problem pure and simple. There was no question whatever but that structural balance and functional efficiency could be easily obtained. A full

complement of teeth, however, was not in harmony with the facial balance, and it did not need a Benvenuto Cellini or a Michelangelo to discern this. After discussions extending over a period of about two months with the family, who I feel have as much right to use their artistic judgment in these matters as we have, four premolars were removed with an improvement in facial balance which can be noted in the photograph but which in reality does not begin to show the change which has actually taken place.

Fig. 35.



Fig. 36.



Figs. 44 to 46 show the models of a patient who had already had several years of treatment before coming to me. I was supposed to finish the case and this I told the parents I felt could be done only by means of a rather drastic compromise. The case was in a condition of open-bite and very much retarded in the matter of eruption of teeth. The lower molars were tilted back due to

Fig. 37.



Fig. 39.



Fig. 41.



Fig. 42.



Fig. 43.



Fig. 40.



Fig. 38.



Fig. 42.—Before treatment.
Fig. 43.—After treatment. Four premolars were extracted purely for esthetic reasons.

the injudicious use of the lingual arch and the whole case was in a condition of orthodontic stasis. I advised the removal of four premolars which was not agreed upon by the parents and the treatment was discontinued. Two years later they decided that my opinion was correct and treatment was resumed. The rest of two years undoubtedly did a great deal of good in restoring some of the histologic structure of the bone. Johnson twin-arch appliances were again used in this case as illustrated in Fig. 47, and the present condition of the case is shown in Figs. 48 and 49. The teeth are all squarely on the ridges, the bite has been closed, and the facial balance is exceedingly satisfactory. As a result of this treatment this boy is now preparing himself to enter the dental school with the hope of eventually becoming an orthodontist.

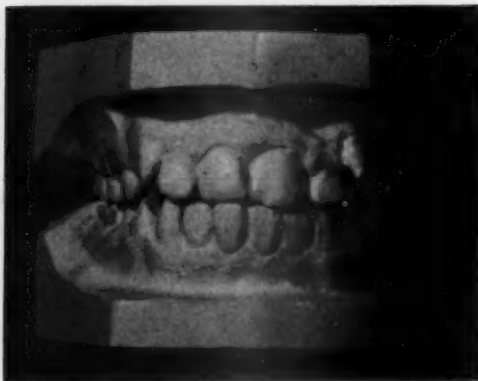
Fig. 44.



Fig. 45.



Fig. 46.



Figs. 50 to 53 show the models of just another case of distoclusion. In order to make it possible for the mandible to move forward to its position of

Fig. 47.



Fig. 48.



Fig. 49.



"functional advantage" a Johnson twin-wire appliance was used to align the maxillary incisors. After this was done, intermaxillary elastics were employed in conjunction with a vulcanite bite plane with buccal extensions, as illustrated in Fig. 57. Fig. 54 shows the deep overbite without the bite plane in place. Fig. 55 shows the bite plane in place showing the vertical change which is needed in the molar and premolar regions. Fig. 56 shows the change which has taken place in a period of less than two years. Why there should be any prejudice against the use of bite planes, either fixed or removable, is quite beyond my own comprehension.

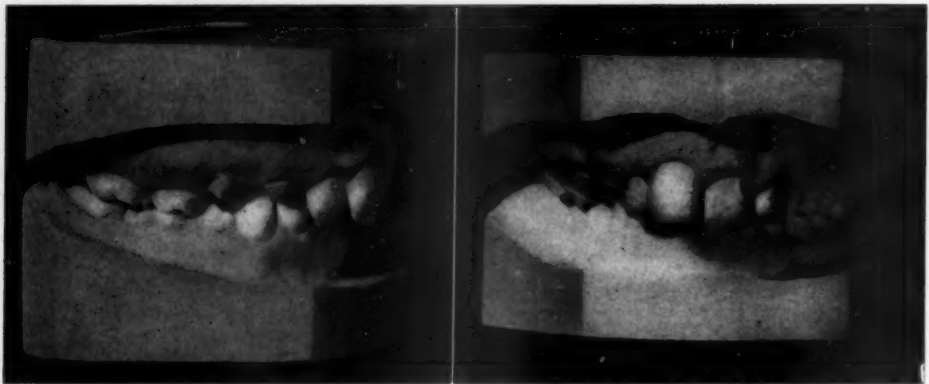


Fig. 50.

Fig. 51.

Fig. 52.



Fig. 53.



I hope I may be forgiven if I have conveyed any impression of finality about any of the views which have been expressed. On the other hand I have

Fig. 56.



Fig. 57.

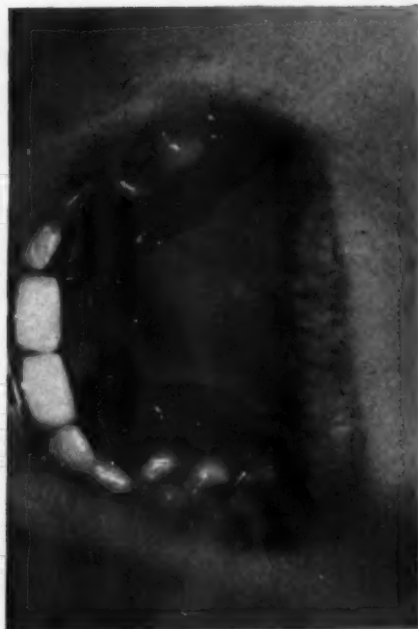


Fig. 54.

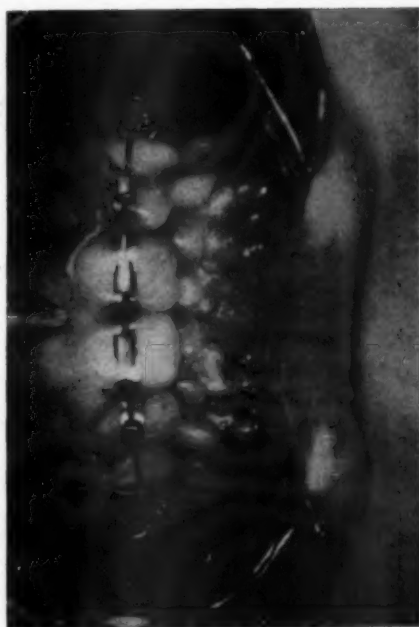


Fig. 55.



Fig. 57.—In cases of distoclusion with deep overbite, the use of bite planes in conjunction with fixed appliances seems as natural as disengaging the clutch while changing gears.

no apology to offer for myself in regard to how they differ from other writers on the same subject. The great feeling of inadequacy which I do feel comes from a realization of the limitations of the human mind to cope with the stupendous vastness of the subject. Our best efforts are about as delicate as those of the proverbial bull in a china shop.

In a letter to Charles Kingsley, Thomas Huxley said:

"My business is to teach my aspirations to conform themselves to fact, not to try and make facts harmonize with my aspirations."

1218 MEDICAL ARTS BLDG.

ROOT RESORPTIONS AND THEIR RELATION TO PATHOLOGIC BONE FORMATION

PART II. CLASSIFICATION, DEGREES, PROGNOSIS AND FREQUENCY

HERMANN BECKS, DR.MED., DR.MED.DENT., D.D.S., F.A.C.D., AND
ROY C. COWDEN, D.D.S., SAN FRANCISCO, CALIF.

INTRODUCTION

IN A recent investigation¹ a high percentage of patients with multiple root resorptions, who had or had not received orthodontic treatment, were found to be suffering simultaneously from certain systemic disturbances which were not of a uniform type. Detailed statistical information was given regarding the roentgenographic aspect of jaw and alveolar bone structure of these patients, and it was noted that the majority had either an atrophic or dystrophic type of bone condition. It was found that only one-fifth of all orthodontically treated cases exhibited roentgenographically normal osseous structure. These findings pointed out the great importance of a thorough evaluation of dental roentgenograms and medical records of orthodontic applicants before orthodontic therapy was instituted in order to determine whether or not any degree of root resorption could be anticipated in the course of treatment. Furthermore, it brought out the interesting observation that not only orthodontically treated patients develop root resorptions, but also that individuals with favorable occlusion who are suffering from systemic disorders are so affected.

The following report deals with the classification, degrees, prognosis, and frequency of root resorption, based, in part, upon the material previously described^{1, 2} and on additional observations.

1. CLASSIFICATION OF ROOT RESORPTIONS

1. It has been generally accepted that *inflammatory processes* in the paradentium, especially in the periapical region, can produce resorptive processes of the root surfaces. Resorptions of this type are sometimes of a very slight degree and hardly recognizable in roentgenograms. At other times, the disappearance of large portions of the roots can be observed. These inflammatory processes usually originate from the pulp canal or from paradental infections, and only rarely are they the result of an hematogenous infection.

2. Root resorptions resulting from *trauma, excessive functional stress, and pressure* are frequently observed as a second type. Excessive mechanical forces applied in orthodontic therapy, especially when roots are moved against the dense and heavy cortical plate, can produce slight and sometimes extreme resorptive processes.

Read before the Biennial Meeting of the Edward H. Angle Society of Orthodontia, Chicago, Oct. 9, 1939.

From the Divisions of Dental Medicine and Orthodontics of the College of Dentistry and The George Williams Hooper Foundation for Medical Research, University of California, San Francisco, California.

In all instances when root resorptions are found clinically (sometimes not noticed until the third and fourth decade of life), it is necessary to establish whether or not previous orthodontic treatment had taken place. Furthermore, the fact that single teeth whose eruption has been delayed, sometimes exerting pressure against roots of permanent teeth already in position, thereby producing root resorption, makes it necessary to obtain detailed data as to the history of tooth eruption time, etc. This type of root resorption of one or more teeth must be recognized as "pressure atrophy."

Cystic formations as well as neoplasms near dental structures can also lead to root resorption by exerting pressure during the process of expansion.

Frequently, patients with single root resorptions, especially in the anterior region of the denture, present a history of a fall or blow, without showing, however, a loss of vitality of the pulp tissue. This traumatic injury of the periapical osseous structure leads to an increased osteoclastic activity and reformation of the bony tissue in this area,⁶ involving cementum and dentine as well. Following such an injury, the osseous structure presents (at least, temporarily) all characteristics of an osteodystrophy, which frequently is restored again to normal after a period of rest. If the root surface became involved in this resorptive process, the periodontal membrane assumed again a normal width, and the shortened root end was the only reminder of the injury.

3. Most difficulties have been encountered in explaining resorptive processes for which no obvious cause could be found and which, in the past, have been called "idiopathic root resorptions." Since these idiopathic types are comparatively frequent, it behooves every dental and orthodontic practitioner to analyze thoroughly each patient's dental history for the above-mentioned possibilities under Nos. 1 and 2, as well as his medical history. Experience has taught us that most cases with such idiopathic root resorptions are suffering from certain internal diseases which affect the teeth either directly or indirectly.^{1, 2, 3} Very few data are available today as to the effect of systemic diseases on tooth structure; however, experimental experience of many investigators seems to indicate that the osseous and connective tissue parts of the paradentium are quite readily influenced by various internal disturbances.

Dentomedical examinations of orthodontic applicants during the past few years have impressed us with the possibility that many systemic conditions in cases of so-called "idiopathic root resorption" must be considered of etiologic importance. In almost all instances in which a mechanical influence could be ruled out, a systemic background was noticed, and it must therefore be suspected that a definite systemic etiology of the "idiopathic" root resorptions exists.* In the experience of the writers, no uniform systemic disease for all cases of root resorption seems to exist; however, as previously reported, endocrine disturbances were found as frequent as 92 per cent in 50 patients with root resorptions and *with* previous orthodontic treatment. The mere frequency with which endocrinopathies are found in patients with root resorption, however, does not permit as yet the conclusion that these conditions have *produced* the resorptions. Addi-

*At the present time, our dental education does not provide sufficient training on physical diagnosis which would enable the dental practitioner to recognize and diagnose physical defects, metabolic disorders, constitutional and generalized infectious disease. We must therefore rely, for the time being, upon the cooperation of the medical profession, which, however, has had little experience with fundamental problems in dental science.

tional experimental evidence will be required to provide ultimate scientific proof. For the present, it appears necessary more than ever to have orthodontic applicants and patients who have already developed marked root resorptions minutely analyzed with regard to any possible endocrinopathy or other systemic disorders. However, the profession must be warned against conclusions of endocrine dysfunctions which are based solely on laboratory data. It must be kept in mind that the very intricate changes of general and local metabolism in the body as controlled by the endocrine glands are only partly understood.

4. A fourth type of root resorption which, according to the writers' knowledge, has not been described, appears as a *result of inactivity*.

The following case might illustrate the observations which have been made frequently:

Following the extraction of the third molar in the right mandible, the maxillary right third molar began to extrude. After seventeen years had elapsed, the roots of the maxillary third molar (Fig. 1) had disappeared almost completely. The patient complained of slight drawing pain in this area, which started "a few years" after the extraction. The gum tissue appeared clinically normal. The patient did not give any history of orthodontic treatment or systemic disorder.

Another patient, female, 45 years of age, had always been a mouth-breather. Denture casts and roentgenograms of maxillary and mandibular anterior teeth are given in Figs. 2, 3 and 4. The apices show definite symptoms of previous resorptions; there was no history of previous orthodontic treatment.

The amount of time elapsed between the extractions of a tooth, or teeth, and the development of root resorptions in teeth of the opponent jaws must be considered, as well as the age of patients with lack of occlusion. The longer the interval or the older the patient, the more marked is the resorptive process, which is even accelerated in patients with systemic disorders.

From the standpoint of differentiating between these four types of root resorption, it is obvious that the inflammatory as well as the inactivity types could be readily recognized because the patient's history and clinical and roentgenographic findings would easily establish the diagnosis. In orthodontic practice, the decision is much more difficult as to whether the root resorption is produced by pressure alone, i.e., without a systemic disturbance, or the result of a combination of mechanical force in coexistence with a systemic disorder. The fact alone that extensive root resorptions can occur without any previous orthodontic treatment suggests the possibility that many resorptions found during the course of orthodontic therapy are the expression of such a combination.

For the prevention of root resorption, a careful evaluation of the medical findings has proved to us of great value in dubious cases.

2. DEGREE AND PROGNOSIS OF ROOT RESORPTION

The high frequency of root resorptions noted by many practitioners has raised the question of whether it is possible to arrest them at any given stage, or whether the prognosis must always be considered unfavorable.

In examining a large number of orthodontic patients roentgenographically before and at the completion of orthodontic therapy, one is struck by the large

number of resorptions disclosed by such routine examinations. Even though some of them are only of a slight degree, one is never certain as to whether they are solely the result of excessive pressure during active tooth movement, or whether they developed in coexistence with some endogenous factor. For this reason, it is most difficult to judge their prognosis only from an examination of roentgenograms or even from a thorough description of the course of orthodontic treatment. A rather strong mechanical force applied to teeth of one individual may not result in any root resorption, while sometimes only a small

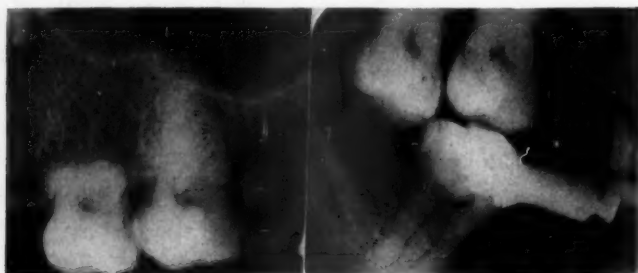


Fig. 1.—Extrusion of the third molar in the right maxilla, 17 years after extraction of opponent tooth. Note marked root resorption of extruded tooth as result of inactivity (Pl. 1482).

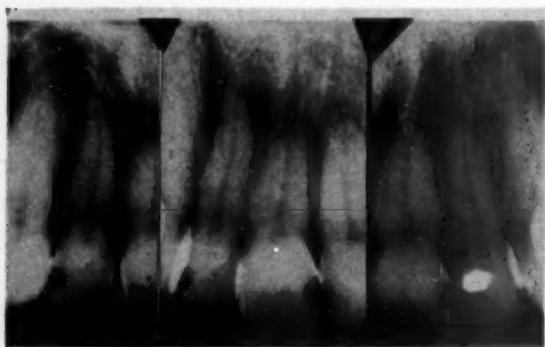


Fig. 2.

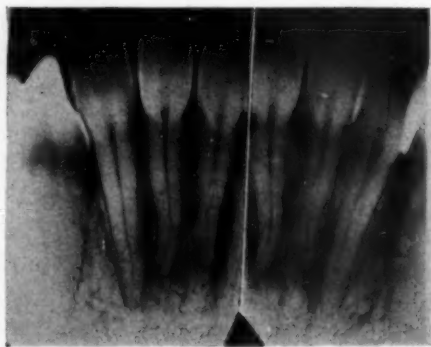


Fig. 3.

Figs. 2 and 3.—Roentgenograms of individual 45 years of age. Root ends in upper and lower jaws appear shortened with widened peridental membrane spaces (Pl. 837, 849).

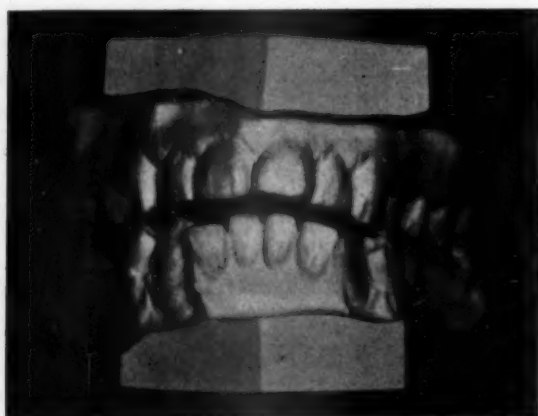


Fig. 4.—Denture casts of the case shown in Figs. 2 and 3. Lack of occlusion in anterior region is apparent (Pl. 5718).

fraction of the same pressure in another individual will produce a disappearance of a large portion of the root. On the other hand, these same varying degrees of resorptions can be observed, as stated before, entirely without orthodontic treatment.

The prognosis of the life expectancy of each tooth with root resorption, therefore, depends, to a large extent, upon the degree which the resorption has reached at the time it was recognized for the first time, possibly during the course of orthodontic treatment,* and the systemic background of the patient (if an endogenous relationship can be established).

In all instances in which the resorptions are found in coexistence with systemic conditions involving bone metabolism, the prognosis must be considered unfavorable, except when the actual etiologic factors can be found and therapeutically influenced. On the other hand, if the resorption has reached a certain level due to excessive pressure, the prognosis varies according to the degree.

It has been our experience that three distinct degrees of root resorptions can be observed which determine the prognosis individually. Fig. 5 gives a graphic demonstration of these three degrees.

In dividing the root surface into three-thirds and observing the amount of resorptions in a large number of orthodontic patients, it becomes quite evident that the majority of them are rather slight and remain limited to the apical third of the root (Fig. 5, *I*). We have designated these as "first degree resorptions." They are also found frequently as the result of apical inflammatory conditions, trauma, chronic irritations, as well as in instances in which endogenous factors are at play. As long as the resorptive process is still active, for instance, as is demonstrated in Fig. 6, the apical peridental membrane space is definitely and sometimes irregularly widened. If in this stage the etiologic factor is recognized and removed, such as the excessive mechanical stress in this case, the prognosis must be considered favorable. If, however, the orthodontist fails to recognize the slowly progressing resorption, it will soon involve larger portions of the root and change the prognosis to a great extent. In these and in other instances, we sometimes find that more than only the apical third of the root has disappeared and the irregular resorptive surface is found somewhere in the middle third of the root. This rather advanced condition, which should be called "second degree resorption" (Fig. 5, *II*) renders the prognosis dubious in many instances. Temporary or permanent splints may appear indicated because a loosening of the teeth leads frequently to gingival irritation with a subsequent loss of marginal bone structure. And finally, if the resorption becomes most extreme, with only little bony support remaining, we speak of a "third degree resorption" (Fig. 5, *III*) which has a very unfavorable prognosis. Second and third degree resorptions are demonstrated in Figs. 7 and 8 of patients treated orthodontically.

An additional complication may occur if, simultaneously with apical root resorption, the alveolar crest begins to atrophy in a horizontal or vertical direction. In such instances the tooth very soon shows a considerable loosening. It must be recognized that such a combination of an attack on tooth structure as well as paradental tissue, is the most dangerous one. A root resorption first degree, to-

*It need hardly be mentioned that routine roentgenographic examinations before the beginning of orthodontic treatment and at various intervals during its course should be obligatory for every orthodontic practitioner.

gether with a horizontal or vertical atrophy, can accelerate the elimination of the tooth in a comparatively short period of time. In such instances we speak of a "combined type" (Fig. 9). It hardly need be mentioned that its prognosis is most unfavorable and the teeth involved are usually doomed.

As will be shown later, the majority of root resorptions occurring during the course of orthodontic treatment are fortunately enough only first degree resorptions. The question is disputable as to whether it is better to sacrifice a small portion of the root, if necessary, and correct the malocclusion than to leave the anomaly untouched because of fear of finding root resorption at the end of treatment. In all instances, however, it must be remembered that the operator is apt to lose control over the resorptive process if an accompanying systemic disturbance is not recognized. The mechanical forces accelerate the resorptive process, and it is difficult to predict when it will become inactive.

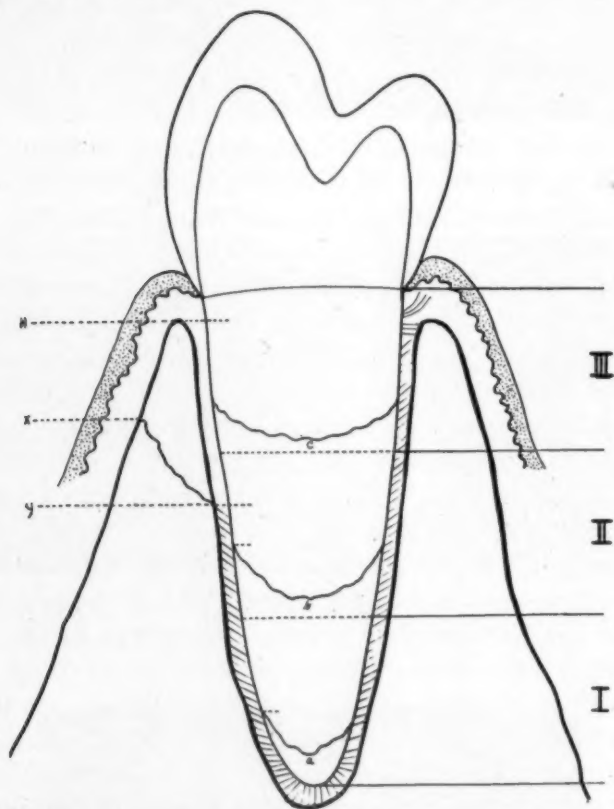


Fig. 5.—Classification of root resorptions into I, II, III degrees. The lines *a*, *b*, and *c* indicate the surfaces of the root ends following various degrees of resorptions:

H = Height of the alveolar crest under normal conditions.

x = Height of the alveolar crest following marginal resorption.

y = Deepest point of resorption of alveolar bone (Pl. 7015).

3. FREQUENCY OF ROOT RESORPTIONS OF ORTHODONTICALLY TREATED CASES

Since the first publications of Ketcham in 1927,⁴ the question of frequency of root resorptions occurring during orthodontic treatment have been widely discussed. While Ketcham found 21 per cent of root resorptions in his private practice, other clinicians have stated that their findings are much lower, and again it has been the experience of others that their observations of root resorp-

tions exceed by far the percentage quoted by Ketcham. In many instances the operator has been held solely responsible for them; in others, the length of the duration of treatment, early or late start of orthodontic therapy, difference in sex and nationalities, heredity or nutritional and endocrine disturbances have

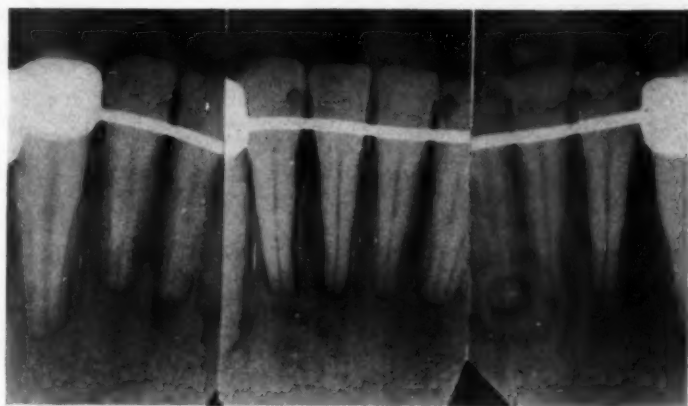


Fig. 6.—First degree root resorptions during orthodontic treatment. Peridental membrane spaces are widened (Pl. 648).

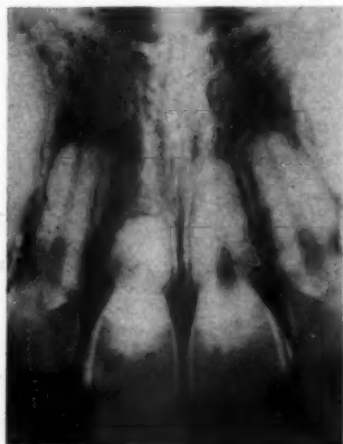


Fig. 7.

Fig. 7.—Second degree root resorption of right maxillary central incisor (Pl. 640).

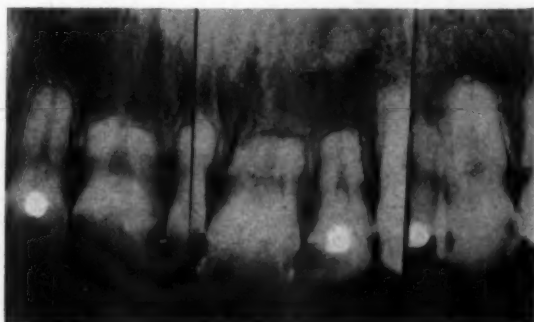


Fig. 8.

Fig. 8.—Third degree root resorptions of left maxillary central and lateral incisors at the end of two years orthodontic treatment (Pl. 668).

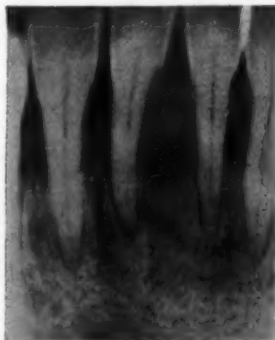


Fig. 9.—Combined root resorption and marginal bone atrophy with most unfavorable prognosis (Pl. 2219).

TABLE I
BONE CONDITIONS, DEGREE OF ROOT RESORPTIONS AND TYPE OF APPLIANCES OF 26
ORTHODONTIC PATIENTS

NO.	PATIENT	TYPE OF APPLIANCE	BEFORE	AFTER 6 MO.	AT COMPLETION	DURATION OF ORTHODONTIC TREATMENT	ROENTGENOGRAPHIC APPEARANCE OF BONE STRUCTURE
1	SH	Ribbon arch mechanism	None	1st	1st	1 yr.	Good
2	EO	Ribbon arch mechanism	None	None	1st	1½ yr.	Osteoporosis
3	EP	Ribbon arch mechanism	None	1st	1st	1½ yr.	Good
4	BP	Ribbon arch mechanism	None	1st	1st	1½ yr.	Good
5	TK	Lingual & labial & lingual arch mechanism	None	None	None	1 yr.	Good
6	MS	Ribbon arch mechanism	None	1st	1st	2½ yr.	Osteoporosis
7	CD	Ribbon arch mechanism	None	1st	1st	3½ yr.	Osteoporosis
8	BM	Ribbon & edgewise arch mechanisms	None	1st	1st	1 yr.	Osteoporosis
9	JN	Ribbon arch mechanism	None	2nd	2nd & 3rd	-	Osteoporosis
10	AW	Ribbon & edgewise arch mechanisms	None	1st	2nd	1½ yr.	Osteoporosis
11	FF	Labial & lingual & labial-lingual-ribbon arch mechanism	None	None	1st	2 yr.	Osteoporosis
12	SG	Ribbon arch mechanism	None	None	1st	3 yr.	Osteoporosis
13	MW	Ribbon arch mechanism	None	1st	1st	2 yr.	Osteodystrophy
14	PN	Ribbon arch mechanism	None	1st	1st	2 yr.	Osteoporosis
15	RP	Ribbon arch mechanism	None	1st	2nd	1 yr.	Good
16	FA	Ribbon arch mechanism	None	1st	2nd	2 yr.	Osteoporosis
17	JR	Ribbon arch mechanism	None	1st	2nd	3½ yr.	Osteoporosis
18	EH	Ribbon arch mechanism	None	1st	1st	1 yr.	Osteoporosis
19	CB	Ribbon arch mechanism	None	1st	1st	1 yr.	Good
20	GB	Ribbon arch mechanism	None	1st	1st	2 yr.	Osteoporosis
21	WL	Ribbon arch mechanism	None	1st	1st & 2nd	2½ yr.	Osteoporosis
22	PB	Ribbon arch mechanism	None	1st	1st	4 yr.	Osteoporosis
23	LB	Ribbon arch mechanism	None	None	1st	1½ yr.	Osteoporosis
24	PH	Ribbon arch mechanism	None	1st	1st	2 yr.	Good
25	FH	Ribbon arch mechanism	1st	2nd	2nd	2 yr.	Osteoporosis (Horizontal Atrophy)
26	DF	Ribbon arch mechanism	1st	2nd	2nd	1½ yr.	Osteodystrophy Horizontal Atro.

been blamed. Oppenheim, whose extensive studies of the effects of orthodontic forces on tissues of human jaws have been a great contribution to our present knowledge of biologic processes, has come to the conclusion that the biologic movement of teeth, as occurs in natural growth and development, cannot be duplicated by orthodontic procedure and that we always must reckon with "certain changes in the bone, cementum, and pulp. . . ." This viewpoint has been shared by many others. As far as this report is concerned, an attempt was made to study the frequency of root resorption which may occur in a clinical institution where patients are primarily treated by students and to consider the physical setup of these patients and the clinical and roentgenographic aspect of their mouths and jaws.

For this purpose twenty-six orthodontic patients were selected who had been under treatment from one to four years. The types of appliances used, which, for the main part, were the ribbon arch mechanism, as well as the frequency and degrees of root resorptions before, during, and at completion of orthodontic treatment, together with roentgenographic appearance of bone structure, are given in Table I.

It is interesting to note (Table I) that after six months of active orthodontic therapy, eighteen patients showed roentgenographic evidence of first degree resorption, while in three even more than the apical third of the root had disappeared (second degree). Five patients showed no changes of the root surfaces. At the completion of the treatment, i.e., at the end of from one to four years, the frequency of root resorption became greatly increased: eighteen had first (one of which had also second degree resorption, No. 21) eight had second (one of which had also third degree of resorption, No. 9), one had a third degree resorption, and one patient had all his roots intact. In other words, the frequency of resorption increased 23.12 per cent after the first six months of active tooth movement to the time of completion of the work and the surprisingly high figure of 96.2 per cent of all individuals treated orthodontically from one to four years developed root resorption (Table III).

This picture is certainly alarming, even though the material presented here is comparatively small. However, the high incidence of root resorptions indicates that we have to look more than ever into possible etiologic factors aside from excessive mechanical forces. For this reason the medical findings of these twenty-six patients were evaluated. Their ages ranged from 9 to 24 years, while the majority were between 10 and 14 years old. There were sixteen girls and ten boys. The physical examinations revealed a large number of defects which, for the main part, were of a general systemic nature, while six patients were found to be entirely negative.

Aside from the various conditions found in these patients which are listed in Table II, it is interesting to note that a number of them had a low basal metabolic rate without obvious symptoms of hypothyroidism. It must be emphasized that it is difficult to decide on the basis of only twenty-six cases as to whether or not the systemic disorders are responsible for the root resorptions which occurred in the course of orthodontic treatment. It can be seen from

TABLE II

PHYSICAL DIAGNOSIS AND FREQUENCY OF ROOT RESORPTION OF 26 ORTHODONTIC PATIENTS

NO.	PA-TIENT	AGE (YR.)	SEX	PHYSICAL DIAGNOSIS	BASAL ME-TAB-OLISM	NO.	PA-TIENT	AGE (YR.)	SEX	PHYSICAL DIAGNOSIS	BASAL ME-TAB-OLISM
1	SH	9	♀	Mild Rickets	-23.0	14	PN	12	♀	Poor develop-ment—Adenoids	-13.0
2	EO	10	♂	Tuberculosis	+10.8						
3	EP	10	♀	Congenital Heart Condi-tion	-1.0	15	RP	12½	♂	Early Mitral Valvulitis	+5.0
4	BP	10	♀	Negative	-5.9	16	FA	12½	♂	Malnutrition—Colloid Goitre	-2.4
5	TK	11	♂	Pituitary & Thyroid Hypofunc-tion; Mitral Heart		17	JR	13	♀	Syphilis	-6.4
						18	EH	13	♂	Negative	-11.5
6	MS	11	♀	Overweight—Possible Pi-tuitary	-4.9	19	CB	13	♂	Mouth-Breath-ing; Myopia; Dietary De-ficiency?	-15.1
7	CD	11½	♂	Severe Con-genital Heart	-6.7	20	GB	13	♀	Negative	-1.2
8	BM	12	♀	Dietary De-ficiency?	-15.5	21	WL	13½	♀	Exophthalmos Mouth-Breath-ing	-1.2
9	JN	12	♀	Trauma to Mouth	+12.0	22	PB	14	♀	Negative; Hypertrophied Tonsils	+10.5
10	AW	12	♀	Mild Rickets; Hypertrophic Tonsils	+8.0	23	LB	14½	♀	Rapid Growth; Dietary De-ficiency?	-18.6
11	FF	12	♂	Pituitary In-sufficiency; Myopia	-9.4	24	PH	16	♀	Hypothyroid-ism	-14.4
12	SG	12	♂	Bronchial Asthma; Nasal Ob-struction	-13.6	25	FH	22	♂	Cryptic Ton-sils; Colloid Goitre; Circu-latory Insta-bility	-17.8
13	MW	12	♀	Negative (Food Ab-sorption prob-ably poor)	-1.6	26	DF	24	♀	-	-

Table II that they are not of a uniform nature, even though six patients showed definite symptoms of glandular disturbances and five showed defects of the circulatory system.

It has been emphasized before that among the various endocrinopathies found in coexistence with root resorption, hypothyroidism occupied the most prominent place. In fact, it was striking to note that in 80 per cent of fifty orthodontically treated cases,¹ clinical and laboratory findings of hypothyroidism could be definitely established. If this observation is evaluated in orthodontic practice, it appears that in any given case of root resorption a physical examination may provide an important clue as to the predisposing or even causative factor. For this reason, we shall cite from our records a typical history of hypothyroidism which was accompanied by marked root resorption.

The patient, a white man, 21 years of age, stated that he noted undue fatigue since adolescence or period of rapid growth. He could not do his school-work without becoming sleepy and fatigued. He has also had dry skin since

young childhood; perspires with difficulty; hair and scalp dry and hair falls out easily. He has been subject to nasal colds; has a fair appetite; tends to underweight and restless sleep. Patient was obese as a child. Family history reveals patient has one brother, obese; father tall and obese; no goiter or diabetes.

Examination revealed him to be a tall, slender, young man of stated age; rather pale; infected and enlarged tonsils; thyroid at isthmus definitely enlarged. Mouth showed teeth in fair condition, gums slightly retracted. Chest was rather hollow; fair expansion with moderate amount of muscle wasting; heart rate 98, no murmurs. Patient had long legs and arms; height $71\frac{1}{4}$ inches; weight $142\frac{1}{2}$ pounds; arm spread 75 inches; pubis to floor 38 inches.

Blood count:

Hemoglobin 80 per cent (Sahli)

White count 7,000

Red count 4,470,000

Differential:

Polymorphonuclear leukocytes 68 per cent

Small lymphocytes 28 per cent

Large lymphocytes 4 per cent

Basal metabolism. 16.8 per cent minus

Diagnosis: Mild hypogonad type and hypothyroidism. The diagnosis of hypothyroidism was arrived at both on the basis of his clinical history and physical findings.

Roentgenograms taken *before* beginning of orthodontic treatment showed multiple root resorptions and pulp stones (Fig. 10). After one year of orthodontic therapy, most of these resorptions had tremendously increased (Fig. 11).



Fig. 10.



Fig. 11.

Fig. 10.—Multiple pulp stones found in individual 17 years of age, accompanied by slight root resorptions of all teeth. Definite hypothyroidism was found by physical examination and laboratory tests (Pl. 626).

Fig. 11.—Marked root resorptions of all teeth carrying appliances of individual with pulp stones in Fig. 10 (Pl. 1106).

In this particular case, hypothyroidism can be readily accepted as being related to the multiple root resorptions which occurred before the beginning of orthodontic treatment and which was accelerated when pressure was applied.

In our experience, the large number of hypothyroid cases observed during the last few years with root resorptions, whether treated orthodontically or not, places this endocrinopathy on top of the list of general disorders, which should be considered in every patient with a dubious jawbone structure or a definite

osteoporosis. Furthermore, a large number of formerly called "idiopathic root resorptions" can now be classified as being of an "endogenous type."

As has been stated previously, the roentgenographic examination of jawbone structures has given us, in many instances, an excellent index as to whether root resorptions must be anticipated during active tooth movement. An analysis of these twenty-six patients showed that in seventeen instances the roentgenograms revealed a rather wide meshwork of bone trabeculae, with large marrow cavities, closely resembling the picture of osteoporosis. Since the individuals examined were below 20 years of age (with two exceptions), the lack of density of the osseous structure speaks very much for a delayed bone development, which becomes quite evident in comparing these pictures with those of a large number of healthy individuals of the same age. In one instance, certain characteristics of osteodystrophic changes could be noticed (case 26), and both individuals (cases 22 and 26) over 20 years of age with evidence of osteoporosis and osteodystrophy showed clinically and roentgenographically marked horizontal atrophy of the height of the alveolar crest and multiple root resorptions, even before orthodontic treatment was started. If the frequency of root resorptions of these twenty-six patients at the completion of orthodontic treatment is checked against the roentgenographic appearance of the jawbone, nineteen, or 73.08 per cent, occurred simultaneously with atrophic or dystrophic bone lesions, while six, or 23.08 per cent, had normal bone structure.

TABLE III
FREQUENCY OF ROOT RESORPTIONS IN 26 PATIENTS BEFORE, DURING, AND AFTER
ORTHODONTIC TREATMENT

BONE CONDITION BEFORE ORTHODONTIC TREATMENT WAS BEGUN	TOTAL	ROOT RESORPTIONS					
		BEFORE ORTHODONTIC TREATMENT		AFTER 6 MO. OF ORTHODONTIC TREATMENT		AT COMPLETION	
		NO. OF INDIVIDUALS	%	NO. OF INDIVIDUALS	%	NO. OF INDIVIDUALS	%
Normal	7	—	—	6	23.08	6	23.08
Osteoporotic or Osteodystrophic	19	2	7.69	15	57.68	19	73.08
TOTAL	26	2	7.69	21	80.76	25	96.16

These figures compare very favorably with those given in the previous report,¹ which gave a frequency of pathologic bone formation in 74 per cent and of normal bone structure in 26 per cent of fifty cases of root resorption with previous orthodontic treatment. In spite of the smaller number of cases, that is, only twenty-six cases against fifty cases previously reported, it appears that these percentage figures constitute a very significant observation. All osteoporotic and dystrophic jaws developed from first to third degree resorptions while six out of seven with good bone formation developed first degree and one remained completely free.

In this connection, it should be mentioned that the osteoporosis or "progressive atrophy" is by no means an independent nosologic entity, inasmuch as it must be considered rather the result of a large number of diseases, which may be of an infectious or noninfectious nature.

SUMMARY AND CONCLUSIONS

In previous classifications of root resorptions, the following etiologic factors have been considered:

First, inflammatory processes; second, pressure or trauma; third, unknown factors. While it is comparatively simple to obtain adequate information through past history and present clinical and roentgenographic aspects as to the first two types, the third type, commonly called "idiopathic forms" has presented quite a problem in dentistry and in orthodontic practice in particular. It appears that their frequency is much higher than generally reported and that a large number of root resorptions observed in orthodontic practice are not solely the result of mechanical stress ("pressure atrophy"), but rather caused or accelerated by certain systemic conditions which influence bone metabolism. This report seems to confirm previous observations that the nature of these systemic disturbances varies greatly and that dietary as well as endocrine dysfunctions may play a most important part. Physical examinations of twenty-six patients showed six to have definite clinical symptoms of glandular disturbances, and five had circulatory defects. The basal metabolic rate of ten patients was definitely below the lower normal border, which, in some instances, confirmed the clinical diagnosis of hypothyroidism, while in others dietary deficiencies were quite obvious.

On the basis of this study, it is suggested to classify all idiopathic forms in which the local influence can be ruled out as "endogenous forms" in contradistinction to the "exogenous forms," which include the infectious and the pressure forms of atrophy.

Furthermore, it is suggested to include a fourth type of root resorption which frequently results from inactivity of teeth due to lack of functional occlusion of long standing. This type shall be designated in the future as "inactivity type of root resorption," as a subdivision of the "exogenous forms."

Since it is the belief of numerous orthodontic practitioners that many instances of root resorption are unavoidable and of no significance and have a good prognosis of the life expectancy of the tooth, a classification is suggested to indicate the degree and prognosis of apical root resorptions. By dividing the root surface into three-thirds, it is possible to obtain the following groups:

- First degree: Including all resorptions limited to the apical third of the root which usually has a favorable prognosis,
- Second degree: Including those resorptions which progress to and within the middle third of the root and which present a dubious prognosis, and
- Third degree: Including resorption of more than two-thirds of the root surface with an unfavorable prognosis.

The root resorptions first, second, and third degree, combined with a marginal atrophy of the alveolar bone, can complicate the picture greatly, depending upon the amount of bony support remaining. The prognosis can easily change in instances where the lingual or labial bony lamella is very thin and rapidly leads to a horizontal loss of bone structure without the possibility of regeneration.

The frequency of root resorptions as previously reported and again demonstrated in additional twenty-six cases, does not seem to depend upon the duration of orthodontic therapy. The physical condition and its possible influence on bone metabolism appears to be of definite influence, especially in cases where pressure has been carefully applied. In these twenty-six cases, it has been found again that 73.08 per cent had an osteoporotic condition, while only 26.92 per cent had roentgenographically normal bone structures in the upper and lower jaws. All patients with osteoporotic and dystrophic lesions developed multiple root resorptions, most of them within six months. At the completion of orthodontic treatment, which varied from one to four years, the frequency increased to 96.20 per cent, which seems to bear out the statement of Oppenheim⁵ that we always have to encounter damage to the tooth surface, however slight our force might be. These observations confirm those of the previous report and place emphasis on the necessity of a more thorough diagnosis of the physical condition of the orthodontic applicant and the roentgenographic interpretation of jaw and bone condition before treatment is begun.

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Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmänn, 654 Madison Avenue, New York City.

Rapid Orthodontia: (Excerpts from the Minutes of the December Meeting of the Odontographic Society of Pennsylvania, held Tuesday evening, December 5, 1865; Dr. C. A. Kingsbury in the chair.) *Pa. State Dent. J.* 9: 21-26, April, 1942.

The following extract is from a private letter which Dr. McQuillen had received from Mr. John Tomes, F.R.S., of London:

"As a reader of the American publications, I have wondered to see so little noticed of an operation which is now becoming common in England, the twisting of teeth in their sockets then and there with a pair of forceps for the purpose of correcting irregularity of position. It is an operation I have frequently performed in children up to the age even of 13 years, sometimes operating upon two teeth on the same occasion; and, up to the present time, I have not lost a tooth. Although of course loosened in the socket, within nine days they become firmly fixed in their new position, thus saving the tedious treatment which the wearing of a plate involves."

Dr. J. E. Garretson said, speaking from a surgical standpoint, that the operation was not one to be recommended. He continued his remarks as follows:

"Viewing the operation, as in this moment first hearing of it, there seemed many objections to be offered. Temperament would appear to contraindicate it in many cases; anatomical peculiarities in the fangs of the teeth would also, in other instances, present obstacles insurmountably adverse to the performance. It would also seem to be true that the internal vitality of such twisted teeth would be very much risked. Besides these objections, it appeared to be an unnecessarily severe operation, one which American patients would scarcely care about being subjected to; still, these various objections may be more imaginary than real."

Dr. McQuillen pointed out that "The extraction of a sound tooth which sometimes occurs by mistake, and the subsequent union of the parts after its replacement, not to speak of cases of transplantation of teeth from the jaws of one person to those of another, indicated what had been done, and with favorable results.

"The possibility of destroying the vitality of the pulp was the principal objection to the practice advocated; the liability, however, was greatly lessened in young persons where the foramina at the apices of the roots of the teeth are large. Under favorable circumstances, and where cases warranted the operation, he should feel inclined to try the plan."

"Dr. Breen had had some little experience. Having been requested by the parent of a little girl, between 7 and 8 years old, to correct an irregularity of the right superior central incisor which stood out of the circle at the mesial surface one-eighth of an inch, he selected an old smooth pair of forceps, and, without any guide but his own judgment, embraced the tooth within the instrument, and with a slight rotary movement once a day for two weeks, obtained the desired result. For fear of irritation of the parts, he ordered a wash to be used of tannin and myrrh diluted with water. He saw the patient three years after, and the irregularity was corrected."

"Dr. Ellis felt satisfied that to a novice this method of practice would present an inviting and practical aspect—*inviting*, since it obviates the tediousness ordinarily entailed, the suffering and inconvenience (so often unnecessarily) inflicted upon the patient, and the trouble and annoyance accompanying the construction, reconstruction, adjustment, and readjustment of the various appliances employed in the practice of orthodontia; *practical*, since he would feel convinced upon slight reflection that the application of sufficient force must result in the speedy and perfect alignment of a tooth of facial malpresentation. But to our minds, as practitioners of more or less experience, such suggestion does not present in the light of a 'novelty' (although it seems, from the tenor of the communication read, to be so viewed in London), because those of the members who, like himself, had never tried it, were able to adduce as an excuse the apprehension engendered by a knowledge that it was long since tested, condemned, and abandoned."

Dr. Ellis wished it understood, "that he could not from experience pronounce either in its favor or disfavor; but from the weight of the past testimony, and the apparent anatomical and physiologic incompatibilities, he harbored a strong prejudice against its performance."

"If the root of an oral tooth approximated very closely to a perfect, vertical cone, he could conceive that success would likely attend the operation of torsion; but there is rarely observed such symmetrical development, and the prevalence of that peculiar deflection of the terminal portion of a root from the mesial line would necessitate the transit of a considerable arc and consequent rupture of the apical vessels and nerve."

"There are other dangers incurred, viz., the risk of fracture, chronic periosteal trouble, exostosis, and even exfoliation of the alveolar borders. He was cognizant of the latter result having attended the forcible and instantaneous separation of teeth prior to filling, now so much in vogue with certain practitioners, and felt sure that, under the equal or even greater violence of torsion, such a result might be apprehended."

"Dr. Flagg believed 'discretion the better part of valor,' and therefore while he admitted the practice of 'forcible torsion' to be valorous and while he believed in its possible efficacy, he could not view it as in any manner discreet or advisable, for he regarded it as so old-fashioned as to have become obsolete; not that things were valueless from the fact of their antiquity, but the 'modern' practice might certainly be viewed as improving and progressive, or else all recent labors must be stigmatized as wasted energy. The practices of 'transplanting' and 'forcible torsion' were among the accomplishments of dental prac-

tioners of fifty years ago and were then justly regarded as the 'best methods'; since which S springs, V troughs, etc., upon plates had had their day, and in turn were fast becoming obsolete. He wished to assert his full appreciation of Mr. Tomes' well-earned claims to marked consideration in connection with the literature and practice of dentistry, but he must regard the hinted superiority of 'forcible torsion' over the use of plates as indicative of a restriction to this choice which evinced a want of familiarity with the application of the simple but efficacious combination of ligatures and rubber tubing which constituted the present method of correcting such irregularities as were under discussion. He objected to the violence done the parts when forcible torsion was resorted to, recognizing the impossibility of its performance without the concomitant of much suffering, while in judicious use of ligatures, etc., the results were prompt, gratifying, and comparatively painless. He could speak from quite extended personal experience in this matter, for he had corrected, during the past fifteen or eighteen years, some fifty cases in which torsion was indicated as a part or the whole of the operation. The whole appliance for the turning of one or two teeth was easily arranged and adjusted in a few minutes, and more than one readjustment was seldom required, one piece of tubing not unfrequently making the whole correction, almost painless, in a length of time varying from a week to a month, according to the powers of endurance of the patient, that being the criterion for slow or rapid progress."

J. A. S.

Nutritional Deficiencies. Diagnosis and Treatment: By John B. Youmans, A.D., M.S., M.D., Associate Professor of Medicine and Director of Postgraduate Instruction, Vanderbilt University Medical School, Nashville, Tennessee; Assisted by E. White Patton, M.D. 16 illustrations; Pp. 385, price \$5.00, Philadelphia, 1941, J. B. Lippincott Co.

This is not merely another book on diet but presents the management and understanding of nutritional deficiencies as they present themselves in practice. The material is based on observations on animals and on the various clinical phases of nutritional diseases as they occur in man. The subject of prevention of nutritional diseases is given special emphasis. A valuable addition to the book is the chapter on the details of the technique of the various laboratory tests. Specific mention is made of various vitamin and nutritional deficiencies in relation to the teeth. In each case the pathology and pathogenesis are discussed. The effects of vitamin C deficiency on the teeth are shown to be manifested in resorption of dentin which is replaced by osteodentin. The cementum is similarly affected. This is followed by hyperemia and edema of the pulp and subsequent atrophy and degeneration of the odontoblastic layer. The author points out that the gums are affected only when the teeth are present. Thus, infants and toothless persons may fail to show the typical lesions of the mucous membranes. However, many infants will exhibit swellings, redness, and other changes in gums over unerupted teeth.

Vitamin D deficiencies, according to Youmans, are most common in the permanent teeth because rickets usually develop at the time when these teeth are calcified. Youmans feels that the administration of calcium to pregnant and

lactating women is helpful in preventing decay. Bone changes in ascorbic acid deficiencies, scurvy, and rickets are discussed and the effect of nutritional deficiencies on growth is presented.

Dentists, especially orthodontists, will find here a valuable text on the diagnosis and treatment of nutritional deficiencies. The book has a detailed index.

J. A. S.

A Primer on the Prevention of Deformity in Childhood: By Richard Beverly Raney, B.A., M.D., Associate in Orthopaedic Surgery, Duke University, School of Medicine, Durham, N. C.; Attending Orthopaedic Surgeon, Watts Hospital, Durham, N. C., in collaboration with Alfred Rives Shands, Jr., B.A., M.D., Medical Director, Alfred I. duPont Institute of the Nemours Foundation, Wilmington, Delaware; Visiting Professor of Orthopaedic Surgery, University of Pennsylvania; School of Medicine, Philadelphia, Pennsylvania. Illustrated by Jack Wilson. Pp. 188, price \$1.00, Elyria, Ohio, 1941, National Society for Crippled Children, Inc.

This primer is intended for those who make it possible for the orthopedic surgeon to carry on his work of preventing and correcting deformities. Orthodontists will find here much of interest because many of the situations discussed are similar in their basic nature to those encountered in treating malocclusion of the teeth and malrelationship of the jaws. It is well to remember that many dentofacial disturbances are the direct result of childhood deformities. The chapter on deformities of the neck, back, and chest will be found especially interesting. It is to be hoped that in future editions of this work more attention will be given to deformities of the jaws, as well as to the effect of the various braces used in treating deformities of the neck, back, and chest on jaw development in children.

J. A. S.

Body Mechanics in Health and Disease: By Joel E. Goldthwait, M.D., F.A.C.S., LL.D., Lloyd T. Brown, M.D., F.A.C.S., Loring T. Swain, M.D., John G. Kuhns, M.D., F.A.C.S. With a chapter on the Heart and Circulation as Related to Body Mechanics by William J. Kerr, M.D., F.A.C.P. 121 illustrations. Ed. 3, completely revised and reset. Pp. 316, Price \$5.00, Philadelphia, 1941, J. B. Lippincott Co.

The effect of postural defects on dentofacial development in children is well recognized. This book, now in its third edition, deals with the recognition, prevention, and proper treatment of conditions associated with faulty mechanics of the body. Emphasis is placed on the maintenance of physical fitness and health. It is pointed out that a large number of deformities are the result of long faulty use of the body. The skeletal framework invariably grows in a definite manner and outside influence can change its inherent tendency to assume a definite shape. Changes in the face resulting from the faulty body mechanics may be found in asymmetries of the jaws, the cheek-bones, and the skull in general. In the chapter on treatment, it is pointed out that basic physiologic

disturbances must be corrected before the attempt is made to correct faulty mechanical relationships. It should be recognized that the ideal normal is not possible under all conditions. Irrespective of the severity of the condition, however, the cooperation of the patient is absolutely necessary if results are to be satisfactory. The use of charts, photographs, and x-ray films are helpful in explaining to the patient the importance of cooperation. Various exercises are explained. It is advised that exercises should be planned and practiced at definite intervals. Supports and braces, it should be explained to the patient, are a means to an end. This book contains much correlative information for the orthodontist. A bibliography and an index are provided.

J. A. S.

Lues Ossea De Primeira Infância: By João F. Fortes, *Rev. Med. Municipal*, Brazil 3: 7-31, 1942.

The author makes a complete survey of bone syphilis in children, with a large number of cases observed at the Hospital Jesus, Rio de Janeiro. Several roentgenographic and even some historoentgenographic pictures are presented, all concerning cases the author himself has had the opportunity to observe at that hospital. A true atlas is thus presented, in which syphilitic osteochondritis, osteoperiostitis, and osteomyelitis are studied. In some cases, the roentgenographic pictures are confronted with the clinical manifestations.

The author emphasizes the importance of differential diagnosis with rickets and scurvy.

J. A. S.

Unilateral Hypertrophy of the Masseter Muscle: By R. J. Coffey, *Surgery* 11: 815, 1942.

According to the author, unilateral hypertrophy of the masseter muscle presents a problem in differential diagnosis. It may easily be mistaken for a neoplastic involvement of the parotid gland, a salivary retention cyst, or an adamantinoma.

Primary tumors of the masseter are extremely rare. The author could find only nine such cases in the literature.

Non-neoplastic affections of this muscle are much more common as is evidenced by the references quoted by the author.

A case of unilateral hypertrophy of the masseter muscle in a 19-year-old male, in whom the only suggestive finding was the presence of four impacted teeth on the affected side, is presented in detail. Three photographs of the patient are shown.

H. A. S.

Editorial

Facts vs. Fallacies

Read a wide cross section of orthodontic manuscript that has been assembled and published during the period of the last decade and you are impressed with some paradoxical situations that appear within the orthodontic fabric; these lead you to ponder and reflect, and to wonder why some of the foremost leaders and thinkers in the specialty can be far apart in their fundamental concept of things orthodontic.

In this issue of the *AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY* appears an interesting paper read before the Inter-American Orthodontic Congress at New Orleans in March, by the well-known orthodontist and recipient of the first Ketcham award, Dr. John Mershon of Philadelphia. The paper is written in an obviously retrospective mood, after many, many years of experience with the orthodontic problem. To indicate the vein in which the paper was written, Mershon begins by saying, "I speak without presumption because I come before you not to teach you dogmatically, but to tell you what experience has taught me. Nineteen years in general dentistry and thirty-four years in orthodontics must teach a man something. The fact that my cases progress better and more easily today than they did twenty years ago leads me to believe that the things experience has taught me provide a sound approach to orthodontic treatment."

The Mershon paper discusses a number of things and much can be read between the lines by careful perusal of the manuscript, perhaps much more than is actually portrayed in the text. He takes up, for instance, the question of the treatment of deciduous dentures and the treatment of young children; his opinion of this phase of treatment is indeed interesting. You can read much on the subject of the treatment of both deciduous and mixed dentures in children, as advocated by many orthodontists; notwithstanding, you will find that many of the older and widely experienced orthodontists are vigorously opposed to the treatment of deciduous cases, except in extraordinary and unusual situations. These men who take this position contend that, aside from making a rather spectacular showing of before and immediately after treatment, the actual constructive benefits to be derived from such treatment prove to be more or less of a gesture and mean little, over the long period of years, as an influence on the maxillary developmental pattern.

By way of still another classical example in which authors are far apart in their fundamental concepts of the problem, you may read after those whose theme is plainly mechanical in concept. That is to say, the manuscript reflects definite assumption that modern orthodontic treatment requires the use, as well as the skilled operation and adjustment, of delicate precision mechanics designed for the express purpose of moving teeth by precision and segregation methods, as distinguished from the Mershon ideas.

It is becoming increasingly manifest that in the attitude of some experienced orthodontists one senses an approach to the subject that pulls away and in the opposite direction from what is popularly regarded as the "precision concept." In informal discussion at least, they will tell you that the purposeful effort directed toward the precision movement of teeth means little in the ten-year pull of subsequent growth cycle, because the element of growth rearranges to its own liking the ultimate position of teeth in conformity with relative forces and occlusion. If one will thumb back to the authors of ten years ago, he will note some saying that heredity as an etiologic factor in malocclusion is of much less importance than is environment. Today one finds authors doing research on the subject of heredity, who plainly believe, if their manuscript is interpreted correctly, that heredity is by far the most important single consideration to be coped with in the entire problem in the orthodontic field. Even so, it has often been said that controversy is a healthy and wholesome sign in the formative period of the development of any art or science. Notwithstanding, in this instance at least, it seems plain that opinion within the specialty is entirely too far apart in its grass-roots approach in many things, for it to be entirely a constructive omen.

To mention still another instance, one group of religious and painstaking workers in orthodontics contends that they are able to correct closed-bite and make the correction "stay put" indefinitely, by the skilled use of a delicate mechanical procedure involving the axial inclination of the roots of the teeth and subsequently the use of fixed retention. Another group, equally as positive, says that such a thing can rarely be permanently accomplished and successfully held in place over the ten- to fifteen-year period. Then, there are those who have practiced orthodontics as long as a quarter of a century or more, many of whom are now treating the children of the fathers and mothers they treated when they were children. Most of these, at least, will tell you in informal conversation that a permanent and satisfactory result is one thing immediately after active treatment has been concluded, and still quite another thing, ten to fifteen years subsequent to that date. That is to say, growth change and metabolism in that length of time may change the result for better, or for worse, but one thing is certain, that there is marked change in the entire maxillary structure in the long pull.

In any event, numerous paradoxical problems could be pointed out; however, suffice it to say for one who is interested in the orthodontic problem, who is frankly realistic, and who is entirely tolerant of the views of others of wide experience, he will find an interesting paper in reading "Orthodontic Facts versus Fallacies." Probably the key to the Mershon attitude in retrospect, after thirty-four years of practice and treatment, is tritely summed up when he says in his paper, "If I were to coin a phrase which would describe the basis of wrong orthodontic practice, I would say—too much and too soon." The reader will no doubt interpret this comment of the author as meaning that there is too much interference with the normal attributes of growth by the introduction of orthodontic appliances at times when they are not necessary, and that many cases are started so early in life that the lasting benefit to be derived is highly speculative in character. To say the least, the Mershon paper is frank and to the point and is one of the few papers ever published

on the subject that has the temerity to discuss frankly some of the limitations and "dead ends" of orthodontic practice. When Mershon stresses the point, inferentially at least, that past history has been replete with "too much appliance" as a static influence to the normal attribute of growth, few of wide experience will dispute the assumption.

To reduce the theme down to a two-line editorial it might be said that too much moving of teeth and too little cooperation with nature in helping her to grow them into normal occlusion is the orthodontist's most prevalent mistake, and this is no doubt entirely true.

What is your opinion of the Mershon theme? You would probably answer by saying that "I am still trying to learn by experience and guidance from those who have had more experience than I have, and regardless of what I think of the Mershon ideas, his opinion is important, because it is written in the light of thirty-four years of experience in correcting malocclusion and doing nothing else." That much experience with the problem in hand has been enjoyed by but few—therefore, it is important.

Orthodontics is badly in need of a twenty-year research program in which many cases are carried through to successful conclusion, under the supervision and guidance of those who best understand the various methods advocated for the correction of malocclusion of the teeth. Until this is done orthodontics will have to be content for its advancement with the methods which might be called, for the lack of a better name, the methods of rugged individualism.

H. C. P.

News and Notes

Research Section, American Association of Orthodontists

At the present time there is no opportunity afforded men interested in orthodontic research to meet together and discuss their problems. At the last meeting of the American Association of Orthodontists it was proposed that the Research Committee be empowered to arrange a portion of the program for the next annual meeting.

The program will consume one-half day and will be restricted to ten- or fifteen-minute reports by men actively engaged in research in orthodontics, or in its allied fields. Time will be allowed for discussion of all presentations, in order that the greatest benefit may accrue to those participating. All institutions and all individuals are invited to request time.

For further information or time reservations on the program address communication to

ALLAN G. BRODIE, Chairman
Research Committee, A. A. O.
30 North Michigan Avenue
Chicago, Illinois

New York Society of Orthodontists

The next or Fall Meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York City, Nov. 9 and 10, 1942.

Prize Essay Contest

The Research Committee of the American Association of Orthodontists has been empowered by the Board of Directors to conduct a prize essay contest. The prize has been set at \$200.00 and will be offered annually until further notice. The terms of the competition are as follows:

Eligibility.—Any student enrolled in a recognized university, or any person who has completed his or her formal education in orthodontics not more than three years prior to Jan. 1, 1943, is eligible to compete for the prize.

Essay.—The essay must represent a piece of original research having a direct bearing on the field of orthodontics. It may relate either to a biologic or clinical problem and may represent material that has been offered in partial fulfillment of the requirements of a graduate or postgraduate degree, or any graduate, postgraduate or undergraduate contest. No previously published essay will be accepted. All essays must be in the hands of the committee by Jan. 31, 1943. If no essay is deemed worthy by the committee, the prize will be withheld.

Award.—The prize-winning essay will be accorded a place on the scientific program of the annual meeting of the Association, at which time the prize will be awarded. The Association will retain publication rights on the first three choices.

For further information, address

ALLAN G. BRODIE, Chairman
Research Committee, A. A. O.
30 North Michigan Avenue
Chicago, Illinois

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.